VŠB – Technical University of Ostrava

Faculty of Civil Engineering

Department of Building Construction

The Detailed Design Documentation of Apartment Building

Projekt pro provedení stavby bytového domu

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Supervisor: **Ing. Jiří Teslík, Ph.D.**

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ANNOTATION

Fahad AL Mohammed. The Detailed Design Documentation of Apartment Building.
This thesis focus on designing main parts of residential building from civil vision, main Support structures, civil works.

In addition, the mission includes:

- Demolition part - in this case knowing the steps of the operation
  Preparing, in the time of operation and finishing,
- Reconstruction part - in this part should have steps about The possibility of knowing the loads that I will calculate and know the size, weight and type of beam

And how to put it in a position and protect the building from indiscriminate demolition or Cracking.

However, the primary stages during construction process are mentioned and discussed in Detailed ways in this thesis.

Key words:
Reconstruction, residential building, demolition, construction drawings, elements.

Acknowledgment

Foremost, I want to offer this endeavor to our GOD Almighty for the wisdom he granted upon me, the strength, peace of my mind, and good health in order to finish this research.

I would like to thank my supervisor, Ing. Jiří Teslík, Ph.D. to whom I am deeply indebted for his untiring assistance, patience, motivation, and many useful suggestions throughout the course of the investigation of this work. He has always advised me whenever I needed help. My thesis would not have been completed without him.

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LIST OF USED MARKING

FAST	Fakulta stavební
Kg	Kilogram
kPa	Kilopascal
MPa	Mega Pascal
KN	kilo newton
KN/M^2	kilo newton per square meter kilo newton
KG/M^2	kilo gram per square meter kilo newton
qk	Live load
gk	dead load
@	Per
AS	Area steel
VED	shear force
MED	bending moment
m	Meter
m^2	Square Meter
m^3	Cubic Meter
mm	Millimeter
δ	Thickness
γ	Partial factor
°	Degree
φ	Internal friction angle of soil
ρ	Density
σ	Stress
E	Soil deformation module

A – COVER REPORT

A.1 Identification data

A. 1.1

a) The name of the building

Residence building

b) Place of construction

The building is located in the Czech Republic - Ostrava – poruba.

In front of the residential building to the east and south buildings belonging to technical university of Ostrava - faculty of civil engineering.

c) Subjects of project documentation

SO 01 residence flats
SO 02 Infrastructure systems
SO 3 Technical process

A. 1.2 Builder data

a) Name, surname and place of residence

A.1.3 & B.1

b) Name, surname, business name, company ID, if assigned, place of business (physical person)...

c) Business name or company name, if applicable, address, registered office (legal entity) …

A. 1.3 Data on the Joint Documentation Processor

a) Name, surname, business name, company name, if assigned, place of business

(natural person doing business) or business name or name, company ID, address of the registered office)

Fahad AL Mohammed (processor)

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Ing. Jiří Teslík, Ph.D. (Head of the diploma thesis)

b) Name, surname of the principal designer, including the number under which he / she is enrolled in the register of authorized persons led by ČKAIT with marked field, or authorization specialization

This part is not included in this thesis‘s mission

A.2 The division of buildings into buildings and technical and technological facilities

Classification of diploma thesis on individual building objects:

SO 01 residence flats
SO 02 Infrastructure systems
SO 3 Technical processes

The subject of the thesis is only building objects SO 01 and SO 03. Infrastructure systems

Are not subject of the diploma thesis.

A.3 List of inputs

The input for the thesis:

- Diploma Thesis Assignment
- Requirements of the master's thesis Ing. Jiří Teslík, Ph.D.

B – SUMMARY TECHNICAL REPORT

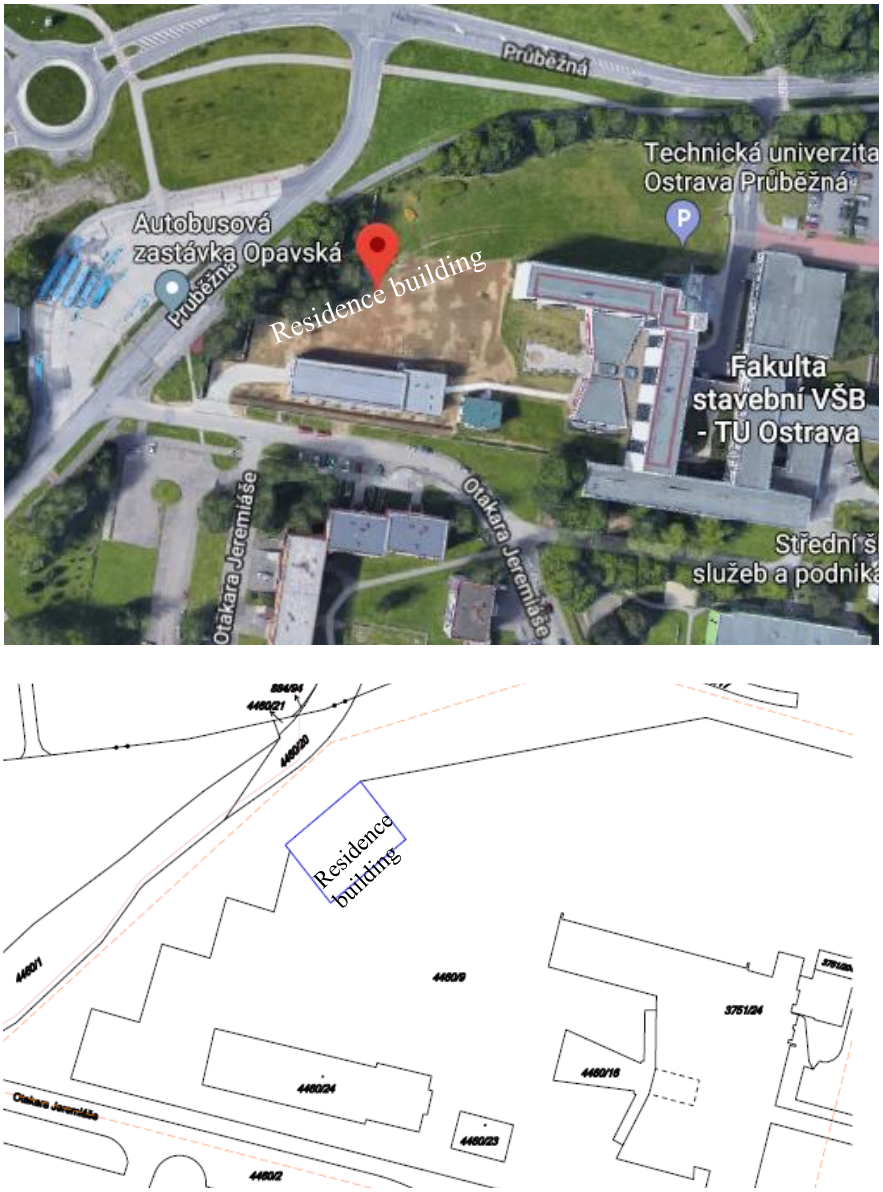
B.1 Description of the construction area

a) characteristics of the territory and building plot, built-up areas and unconstructed areas, conformity of the proposed building with the nature territory, the existing utilization and the built-up areas,

The building Area 336.54 m^2 locates at In front of the residential building to the east and South.

Buildings belonging to technical university of Ostrava - faculty of civil engineering in

The Czech Republic - Ostrava – poruba.



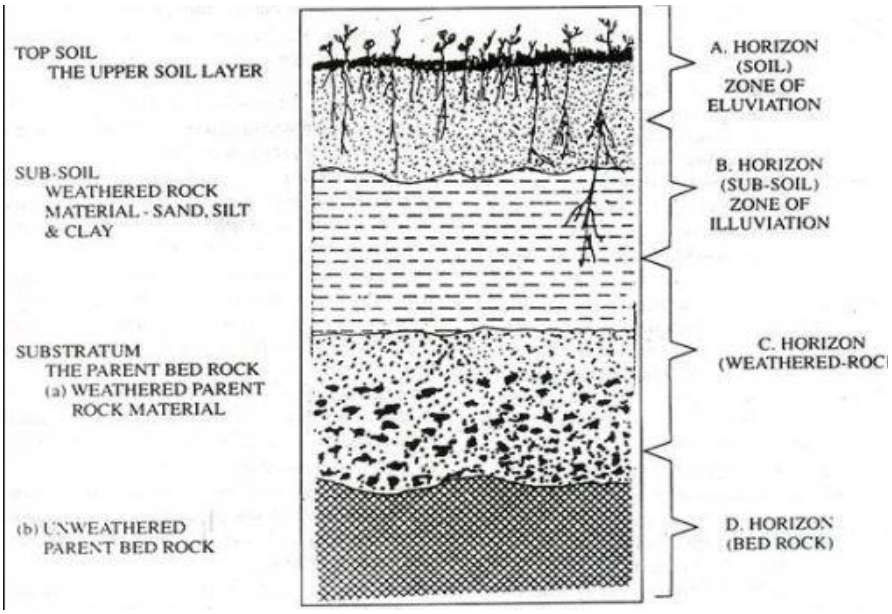
*(**Figure1**): site plan of the building location [refrence1].*

b) List and conclusions of completed surveys and analysis (geological survey, hydrogeological survey, building-historical survey etc.),

- To design the shallow foundation and to meet the assigned requirements, the geotechnical model of the bearing soil has to be defined. This is obtained by assembling data and information from geotechnical investigations as summarized for this example through the following steps:

1. The soil profile is taken from the borehole log;
2. CPTu soil in situ testing gives cone and frictional resistances and the pore pressures with depth;
3. Normalized cone resistance Qt and Friction Ratio Fr are used to classify the different soil deposits.

- Soil profile:



*(**Figure2**): cross section of ground level layers [refrence2].*

- Groundwater level: 2.5m from the ground's surface.

- Radon: The whole is designed (see B.2.10)

- Surveys of structures and surroundings:

Before construction, make sure that there are no problems or changes in the nature of the land on which construction is planned

- Traffic vibration:

Before the construction process to ensure the distance and volume of traffic density from the place of the construction process to be there taking care and prohibition in the construction work that does not affect anything

- Quality test of foundations:

Examination of the foundations before the construction process to find out the amount of moisture and gases affecting the earth. This part is not included in this thesis's mission.

c) Existing protection and safety zones

The building is not located in existing protection and safety zones.

d) Position relative to flood area, undermined area etc.,

The building is not located in position relative to flood area, undermined area etc.,

e) Effect of the construction on surrounding buildings and lands, surroundings protection, the effect of the construction on the drainage conditions in the area,

There are some conditions that affect the surrounding buildings such as pits, shadows,

Sunset direction and sunrise but this part is attached with the attached files.

f) Requirements for sanitation, demolition, tree felling,

Demolition works required see **D.1.1**.

g) Requirements for maximum appropriation of the agricultural land fund or land intended for forestry purposes (temporary / permanent),

This part is not included in this thesis's mission.

h) Territorial technical conditions (especially the possibility of connecting to the existing transport and technical infrastructure),

See drawing layout – foundation plan and section

B. 2General description of the building

B. 2.1 Purpose of building use, basic capacities of functional units

a) New construction or change of completed building; in the case of a change of the building, the data on their current state, the conclusions of the construction technical, eventually the structural-historical survey and the results of the static assessment of the supporting structures,

This new residential building is divided into three sections:

Part I: Infrastructure of the building where it is designed according to the standards and is the foundations of the load-bearing walls and floors and insulation of all kinds, whether water or air or isolate radon

Part II: The first, second and third floor are apartments of load-bearing walls and floors, ceiling and walls of the composite and the bearing walls are concrete The composite wall is also designed of bricks

Part III: On the third floor there is a green roof consisting of several insulation and water channels for drainage.

b) Purpose of building use, basic capacities of functional units,

- Plan purpose: The apartment building locates at the cross street, the location is near with some companies and schools. The building is a long-term strategy for solving accommodation issues and bringing utilities to the neighborhood.
- Basic fountains:

+ First floor: Storage rooms, two flat apartments.
+ Second floor: Four flat apartment.

+ Third floor: two flat apartment and Green roof.

Frist floor

Building envelope	915 m^2
constructions:	
Total energy reference area of the building:	331.36 m^2
Volume of the building:	915 m^3
Flat roof	331.36 m^2
Flooring on the Ground:	331.36 m^2
External wall:	208.5 m^2
Doors:	2.92 m^2
Windows:	40.86 m^2
Shape factor A/V	1.0

Second floor

Building envelope	900 m^2
constructions:	
Total energy reference area of the building:	330.4 m^2
Volume of the building:	900 m^3
Flat roof	330.4 m^2
Flooring on the Ground:	330.4 m^2
External wall:	188.83 m^2
Doors:	0 m^2
Windows:	50.1m^2
Shape factor A/V	1.0

Third floor

Building envelope	939.39 m^2
constructions:	
Total energy reference area of the building:	332.42 m^2
Volume of the building:	939.39 m^3
Flat roof	332.42 m^2
Flooring on the Ground:	332.42 m^2
External wall:	248.08m^2
Doors:	0 m^2
Windows:	26.46m^2
Shape factor A/V	1.0

*(**Figure3**): building envelope of floors.*

B. 2.2 General urban and architectural solution

a) Urbanism – territorial regulation, composition of the spatial solution,

This part is not included in this thesis's mission.

b) Architectural solution – composition of the shape solution, material and color solution.

➢ **Apartment space:**

- In this residential building almost all apartments are designed similar in space and storage This project contains 9 comfortable apartments with an area 62.83m^2 , 62.3m^2
- With regard to the work proposed in the expansion of the second floor, there is a change so that two apartments will be merged to be one apartment with area 125.66 m^2 .

➢ **Living room:**

- In this project all living rooms have been designed with approximately one area 4.0X4.9m with high 2.75m
- All living rooms have a large window dimensions 3.0X1.2m
- The living room has a kitchen area which is comfortable to can move.

➢ **Dining Rooms:**

There is in this residential building space in living room to have space for dining.

- **Kitchen:**

The kitchen area it's in the living room and the dimension of this space 2.6X1.6 m.

- **Storage and utility space:**

In this apartment building each apartment is provided storage rooms divided into fifty

- Each apartment has an external storage room on the first floor at the entrance
  With area 3.47$\boldsymbol{m^2}$.
- Each apartment also has an internal storage room and was designed on
  Two areas 5.58$\boldsymbol{m^2}$ and 3.78$\boldsymbol{m^2}$.

- **Sustainable construction:**

There are two important sources of resources for use in the construction and operational phase. The construction phase includes the use of materials, such as concrete, steel, brick, insulation materials, etc. The production of these materials requires the use of large amounts of energy. This type of energy is called "embodied energy," the amount of energy consumed to extract, purify, process, transport and manufacture any substance.

- **Material Selection:**

Attached with layout drawings.

B. 2.3 General operational solution, production technology

The residential building is designed for comfort and living over a fairly long term and there is no need for public operation.

B. 2.4 Barrier-free building use

I have taken into consideration people with special needs by providing them with two more parking spaces and also a slanting pier at the entrance to the building.

- It was taken into consideration the parking allocated for people with special needs to be with an allowed space and also be close to the main entrance of the building so that the two parking
  Each position has width 3.9m to be sufficient to move absolutely free.

- The entrance to the main building is designed with a 9% slope with Stainless Railings so that the person who needs it can be used to access the main entrance.

- The 1.8m wide elevator is designed to be able to enter a unit or with facilities

- Design of main doors and room doors
  The bathrooms also have space so that the person can move from the chair allocated to the toilet completely free in all apartments that have been designed

B. 2.5 Safety in use of the building

a) Building solution,

- Fire protection: This part is not included in this thesis's mission.
- Occupant safety and health: This part is not included in this thesis's mission.

b) Structural and material solution,

See part **D.1.1** – a) Technical report

c) Mechanical resistance and stability.

This part is not included in this Thesis's mission.

B. 2.6 Basic characteristics of technical and technological equipment

a) Technical solution,

See part **D.1.1** – a) Technical report

b) List of technical and technological equipment.

This part is not included in this Thesis's mission.

B. 2.7 Fire safety solution

a) Division of buildings and objects into fire cells,

This part is not included in this Thesis's mission.

b) Calculation of fire risk and determination of the degree of fire safety, Fire resistance of external wall, ceilings, roof, internal walls

This part is not included in this Thesis's mission.

c) Evaluation of proposed building structures and building products including requirements for increasing fire resistance of building structures,

This part is not included in this Thesis's mission.

d) Evaluation of evacuation of persons including evaluation of escape routes,

This part is not included in this Thesis's mission.

e) Evaluation of standoff distances and definition of fire hazard area,

This part is not included in this Thesis's mission.

f) Provision of required amount of fire water or other extinguishing agent including the distribution of internal and external supply points,

This part is not included in this Thesis's mission.

g) Evaluation of the possibility of fire fighting (access roads, fire fighting roads),

This part is not included in this Thesis's mission.

h) Evaluation of the technical and technological equipment of the building (distribution pipelines, air-conditioning equipment),

This part is not included in this Thesis's mission.

i) Assessment of the requirements for securing the building by fire safety devices,

This part is not included in this Thesis's mission.

j) Scope and manner of deployment of alert and safety signs and tables.

This part is not included in this Thesis's mission.

B. 2.8 Principles of energy management

a) Criteria for the thermal technical assessment,

- Internal temperature: 20°C, humidity 50%,
- External temperature: -15°c, humidity 85%.

b) Energy performance of the building,

- Heat transfer coefficient of the structure:

+ Ceiling: U = 0.119 W/m^2K
+ External walls: U = 0.200 W/m^2K
+ Ground Floor: U = 0.200 W/m^2K

c) Assessing the use of alternative energy sources.

This part is not included in this Thesis's mission.

B. 2.9 Hygienic requirements for buildings, requirements for work and communal environment

The main regulations relating to health and safety on construction sites are the following:

Act No. 183/2006, the Building Act

Act No. 262/2006, the Labour Code

Act No. 309/2006, the Ensuring Further Health and Safety at Work Act Act No. 258/2000, the Public Health Protection Act

Regulation No. 591/2006, providing for Requirements for the Protection of Health and Safety on construction sites.

Legislation also regulates the conditions (relating to health and safety) for employees that

Work in the premises after the completion of construction.

a) Water supply:

It is connected in the apartment building that you designed

His water is extended from the water source closest to the site connected to the main source

Of the city.

The water has been extended under the stairs in this project

Pipework is installed: In a roof space, under a timber floor, below a concrete slab.

Point of entry into the building: Garage and laundry and include an accessible isolating valve, line strainer and pressure limiting valve.

Water heating system: Using electrical and solar heat source; Locating centrally to reduce the length of pipe runs to fixtures because longer pipe runs require more water to be drawn off before hot water is discharged. Install a separate point-of-use water heater for fixtures that are more than 10 m from the main water heater.

Noise prevention: Avoid running pipes over or near bedrooms and living areas.

Pipe materials and specifications: Copper, polyethylene (PE), and cross-linked polyethylene (PEX). The pipes used in a building must not contaminate potable water supply, and must be suitable for the water pressure, flow rate and temperature of water they will be carrying.

b) Wastewater:

Wastewater system connects to the city sewerage system through pipes. Pipe sizing and

Gradient: Diameter for a drain is 250 mm with 1:60 gradient.

The tank is designed to collect rain water from the surface and store the water needed

- Water needed by the building: pumped into the building

- Excess water: is drained to a checkpoint close to the building and then discharged to the

Soil.

c) Lighting:

The lighting is designed according to sunlight and daylight Get as many hours as possible

The windows are designed according to the standards that provide the most benefit from

Natural light

Consideration was given to connecting the entire building with electrical lighting.

d) Heating:

Heat source in the apartment building:

Natural source - the sun

Another source - electricity and central heating.

e) Ventilation:

- Active ventilation: Exhaust hoods in bathrooms and kitchens

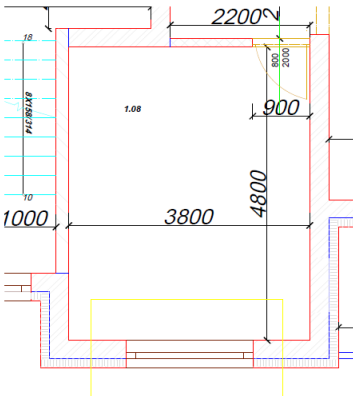
- Passive ventilation: It is a natural source through the windows distributed on all rooms as well as balconies.

B. 2.10 Protection of the building against the negative effects of the external environment

a) Protection against penetration of radon from the subsoil,

Design the insulation against random from subsoil for this new building: Type of

Membrane: Bitumen membrane Elastek 40



*(**Figure4**): the room length*

1.
The room volume: V=3.8 · 4.8 ·2.75= 50.16 m^3
The total contact area: A= 18.24 m^2
Ratio: V/A= 50.16/18.24 =2.75 m
The air exchange rate:
Coupled window: 1200 x 600 mm
L= (1.2+0.6) =1.8 m – length of joints of window
iLV=1.4 m^2 ·s^{-1} ·10^{-4} ·$pa^{-0.67}$
B=8 Pa0.67
(Normal landscape, unprotected building,
Standing alone)
M = 0.7 (1 tight door with sill)

$$n = \frac{3600 \cdot \Sigma(iLV \cdot L) \cdot B \cdot M}{Vm} = \frac{3600 \cdot 5.04 \cdot 10^{-4} \cdot 8 \cdot 0.7}{50.16} = 0.20\ h^{-1}$$

2. The highest permissible radon exhalation rate

$Cdif$=30 $Bq/m3$

$$Elim = \frac{Cdif \cdot Vk \cdot n}{A} = \frac{30 \cdot 50.16 \cdot 0.20}{18.24} = 16.5\ Bq/m^2h$$

3. The design:

a) Variant: Bitumen membrane: Elastek 40 (D=18·10−12 m^2 /s)

$$l = \sqrt{\frac{D}{\lambda}} = \sqrt{\frac{18 \cdot 10^{-12}}{2.1 \cdot 10^{-6}}} = 2.93 \cdot 10^{-3}\ m$$

$$d \geq l \cdot \operatorname{arcsinh} \frac{\alpha 1 \cdot l \cdot \lambda \cdot Cs}{Elim} = 2.93 \cdot 10^{-3} \cdot \operatorname{arcsinh} \frac{7.0 \cdot 2.93 \cdot 10^{-3} \cdot 0.00756 \cdot 50000}{16.5} = 0.46 mm$$

The production thickness d = 4.2 mm d=4.2 $mm \geq 0.46\ mm$

b) Protection against stray currents,

This part is not included in this Thesis's mission.

c) Protection against technical seismicity,

This part is not included in this Thesis's mission.

d) Protection against noise,

Airborne sound insulation: RW 53 dB
External construction: RW = 57dB *[reference3]*
The residential building is designed according to the standards
From that point of view must mention the types of noise
External noise: from traffic, road works, some cases close to construction or demolition.
Internal noise: from some steps people inside the building, washing machine, some elevator cases

e) Flood protection precautions.

The building is not in flood area.

B.3 Connection to technical infrastructure

a) Technical infrastructure connecting places,

See part **D.1.1** – a) Technical report

b) Connecting dimensions, power capacities and lengths.

See part **D.1.1** – a) Technical report

B.4 Transport solutions

a) Description of the transport solution,

This part is not included in this Thesis's mission.

b) Connection of the area to the existing transport infrastructure,

The residential building is connected to the main street (Průběžná)

By opening a sub-street from the main street leading to the parking of the building that was

Designed and shown in the drawings (see drawing landscape).

c) Transport at rest,

Parking is designed according to the permissible standards 13 normal parking
2.6mX5.5m
Two parking for people with special needs with larger space according to the
Permissible standards 3.6mX5.5m.

d) Walking and cycling trails.

This part is not included in this Thesis's mission.

B.5 Vegetation solutions and related landscaping

a) Landscaping,

This part is not included in this Thesis's mission.

b) Used vegetation elements,

A green roof is designed to provide a healthy and complete

Environment for the building and its residents(see attachment page).

c) Biotechnological precautions.

This part is not included in this Thesis's mission.

B.6 Description of the effects of construction on the environment and its protection

a) Effect of the construction on the environment – air, noise, water, waste and soil,

There are NO effects to the environment.

b) Effect of the construction on nature and landscape (tree protection, protection of memorable trees, protection of plants and animals etc.), preservation of ecological functions and links in the landscape,

One side of the trees will be removed due to the presence of trees overlooking the street at the construction site.

c) Effect of the construction on the Natura 2000 system of protected areas,

There is NO effect to the environment.

d) Proposal taking into account the conditions of the conclusion of the detective procedure or EIA opinion,

The construction does not require an Environment Impact Assessment – EIA.

e) Proposed protection and safety zones, range of restrictions and conditions of protection under other legislation.

This part is not included in this thesis's mission.

B. 7 Protection of the population

This part is not included in this thesis's mission.

B.8 Principles of construction organization

a) Needs and consumption of decisive media and masses, their ensuring,

This part is not included in this thesis's mission.

b) Site drainage,

The soil in the site is permeable.

c) Connecting the site to the existing transport and technical infrastructure,

This part is not included in this thesis's mission.

d) Effect of the construction on surrounding buildings and lands,

This part is not included in this thesis's mission.

e) Protection of the surroundings of the building and requirements for related sanitation, demolition, tree felling,

This part is not included in this thesis's mission.

f) Maximum appropriation of land for the site (temporary / permanent),

This part is not included in this thesis's mission.

g) Maximum quantities produced and types of waste and emissions during construction, their disposal,

This part is not included in this thesis's mission.

h) Balance of earthworks, requirements for the supply or deposition of soils,
This part is not included in this thesis's mission.

i) Environmental protection during construction,

This part is not included in this thesis's mission.

j) Principles of safety and health at work on site, assessing the need for job and safety superintendent under other legislation,

Requirements for sanitation:
- Work on the necessary equipment in factories and provide the necessary equipment for Prevention such as fire extinguishers.
- Tests periodically by specialized technicians.
- In the event of a fire must be made of fireproof partitions that do not contain any windows, And this to Prevent the transmission of fire to other places.
- Ensure the safety of all devices and machinery in the factory, and the work of periodic Inspection and Maintenance immediately.
- The appropriate lighting must be available for work.
- Take care to prevent heat, noise, etc.
- Maintain storage and safety rules to maintain products..

k) Arrangements for the barrier-free use of the affected buildings,

The building has been designed to cope with possible special needs (see **B.4**).

l) Principles for transport engineering precautions,

This part is not included in this thesis's mission.

m) Determination of special conditions for construction (construction work in operation, precautions against the effects of the external environment during construction etc.),

This part is not included in this thesis's mission.

n) process of construction, decisive partial deadlines.

This part is not included in this thesis's misson.

C. Layout drawings

Attached drawings.

D. Documentation of objects and technical and technological equipment

D1 Documentation of building or engineering object

D1.1 Architectural-construction solutions

a) Technical report:

- **Apartment space:**

- In this residential building almost all apartments are designed similar in space and storage This project contains 9 comfortable apartments with an area 62.83m^2 , 62.3m^2
- With regard to the work proposed in the expansion of the second floor, there is a change so that two apartments will be merged to be one apartment with area 125.66 m^2 .

- **Living room:**

- In this project all living rooms have been designed with approximately one area 4.0X4.9m with high 2.75m
- All living rooms have a large window dimensions 3.0X1.2m
- The living room has a kitchen area which is comfortable to can move.

- **Dining Rooms:**

There is in this residential building space in living room to have space for dining.

- **Kitchen:**

The kitchen area it's in the living room and the dimension of this space 2.6X1.6 m.

- **Storage and utility space:**

In this apartment building each apartment is provided storage rooms divided into fifty

- Each apartment has an external storage room on the first floor at the entrance With area 3.47$\boldsymbol{m^2}$.
- Each apartment also has an internal storage room and was designed on Two areas 5.58$\boldsymbol{m^2}$ and 3.78$\boldsymbol{m^2}$.

- **Sustainable construction:**

There are two important sources of resources for use in the construction and operational phase. The construction phase includes the use of materials, such as concrete, steel, brick, insulation materials, etc. The production of these materials requires the use of large amounts of energy. This type of energy is called "embodied energy," the amount of energy consumed to extract, purify, process, transport and manufacture any substance.

➢ **Material Selection:**
Attached with layout drawings.

b) List of working stages:

b.1) Preparing of site:

Step1: Collect the Right Materials for the Job
Before you start demolition, make sure you have all the necessary
Tools and safety gear on-hand.

Tools and Equipment Needed to Remove a Wall and Safety Gear:
- Reciprocating Saw
- Sledgehammer
- Pry Bar
- Hammer
- Stud Finder
- Electric Drill
- Utility Knife
- Safety Glasses
- Work Gloves
- Respirator Mask
- Drop Cloths
- Materials Needed to Patch Your Ceiling and Floor Post-Wall Removal
- Drywall
- Drywall Compound
- Drywall Tape
- Drywall Screws
- 2x2 Inch Wood Strips
- Man removing wall wearing respirator mask.

Step 2: Prepare for the Demolition:
Prepare the rooms on both sides of the wall you are removing. Knocking down a wall will create a lot of dust and debris. Protect the rest of your home by taking the following precautions:
- Lay down a tarp or a sheet of plywood over the floor. Plywood will better protect hardwood, ceramic tile or other fragile flooring types.
- Cover vents in both rooms using plastic sheeting and tape to prevent dust being blown throughout your house.
- Use a plastic sheeting and tape to create a partition between any other rooms.
- Cover windows with plastic sheeting to protect them from any flying debris.
- Remove doors, door trim and baseboards. Follow this baseboard removal guide if you're hoping to reuse them in another project.
- Remove paint by Scrape, where you have to scrape the exfoliated parts of the old paint, using the scraper, where it is in a corner and then hit the wall lightly from several sides around the place of peeling.

b.2) Temporary support:

- Temporary support in position to removing:

Replace the support that the wall knocking down is giving and this is usually done using a reinforced steel beam joist (RSJ). This beam is installed in the ceiling to support the floor or roof above.

To install a beam in an existing bearing wall, there are all sorts of tricks and methods. If it is an interior wall, there is a cool way to install a beam without building any temporary support walls.

- Need to have access to both sides of the wall into which the beam is going to be placed. All that you do is simply install half of the beam at a time. You make 5cm deep notches at the top of one side of the wall and slide the beam into this recess. Add the king studs at each end of the beam that run from top plate to bottom plate. You then add the jack studs next to the king studs.

- These framing members actually support the load from the beam. If the rough opening of the new beams is185cm or less, you generally only need one jack stud at each end. Once all of this is in place and the jack studs are solidly supported from beneath, you can take out the remaining old notched wall studs as the weight of the wall will be carried by the one half of the beam that is secure and in place.
- The jack studs will be in both side of wall connected by steel piece.

*(**Figure5**) jacks used in temporary support wall [refrence4].*

- Temporary wall support :

To be under the safety designed the wall support in this case there is different way to build it

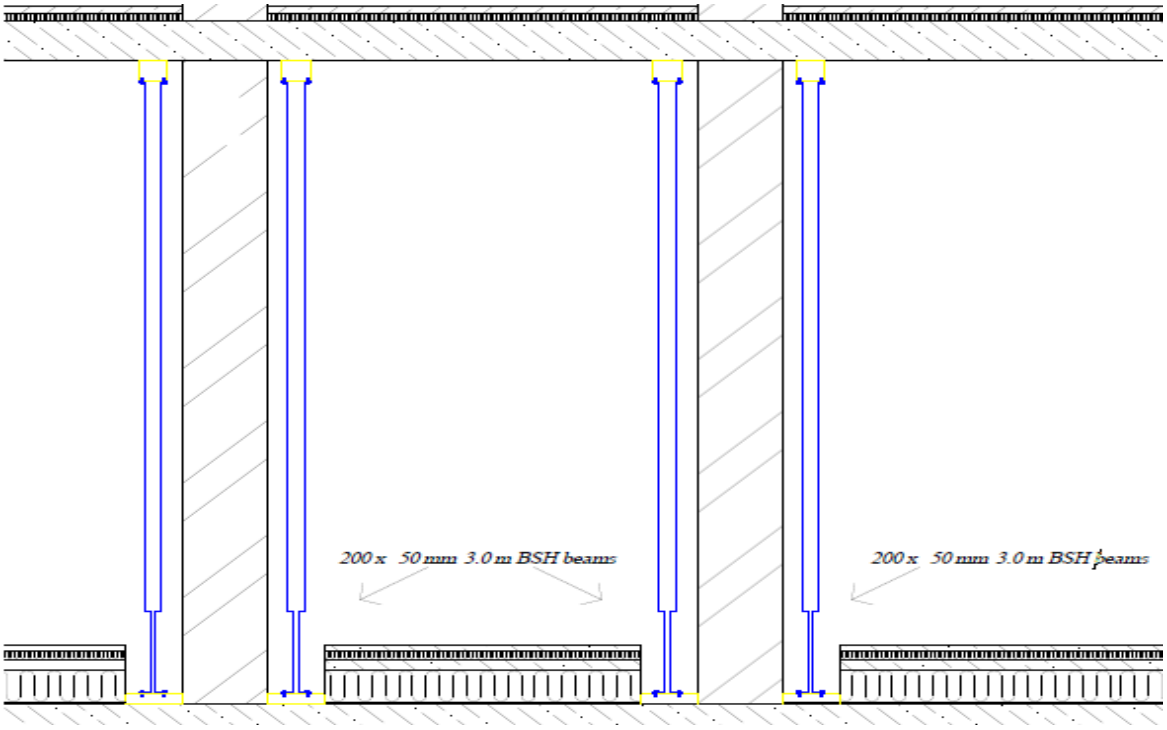
And have to choose material in this case I choose same material steel beam joist (RSJ).

- To distribute the load to the temporary wall supports have to knowing the distance to build this wall.
- The distance in usually it is 60- 100 cm away from the load bearing wall removal
- Generally your temp wall should be no further away than 1/3rd of the total span of the joist.

  Its mean span is 3.1 m so it's mean the distance between the loads bearing wall

  And the temporary support wall is 1.03 m or 103 cm.
- Designed to be lumber plates up of joist under ceiling 5X10 cm to protect and distribute

  The load to joist.

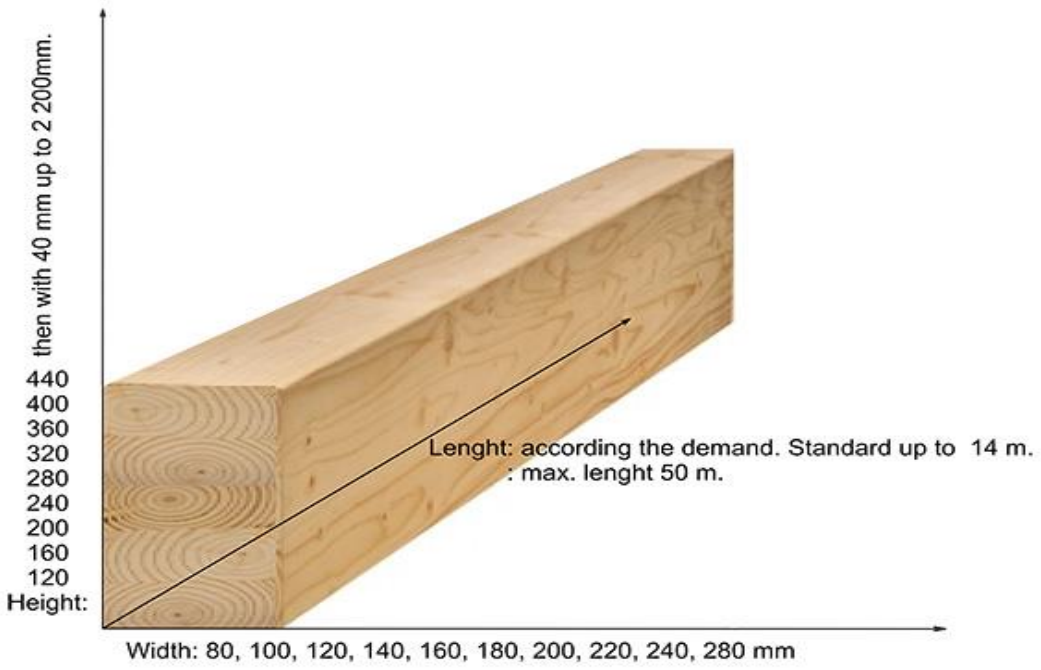


*(**Figure 6**): site view of temporary support wall each side of wall.*

- When you started laying the temporary wall

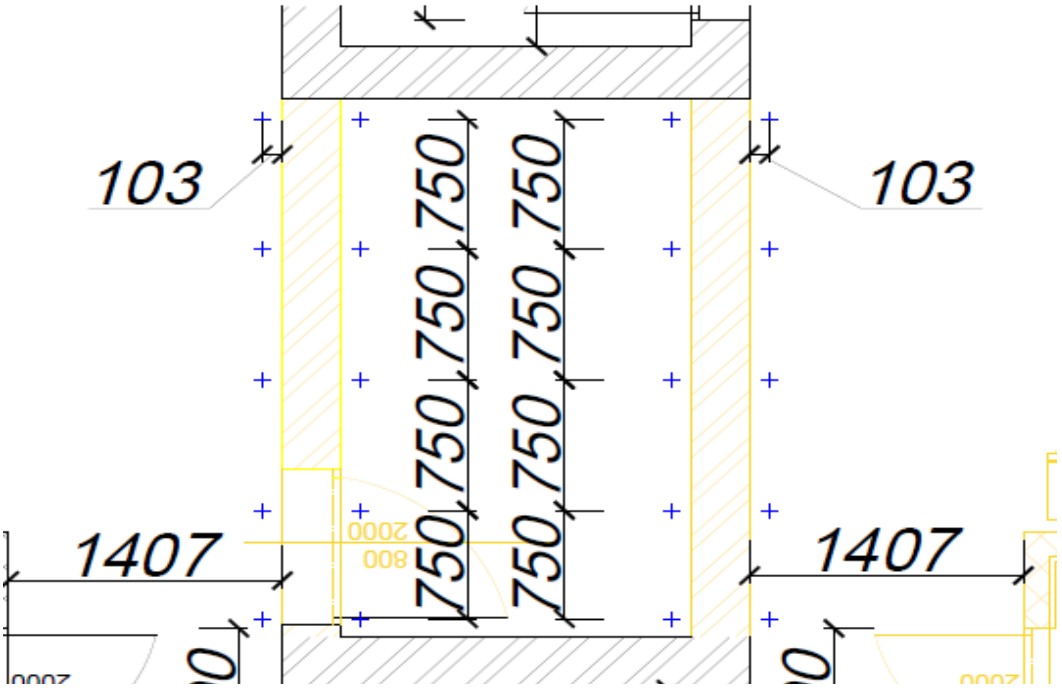
There must be a tool to distribute the load from the ceiling to this tool under this tool the load is distributed over the joists equally.

- This tool was designed by Timber under this design was selected the following:
- BSH beams use:
- Construction with big lengths, load and low weight.
- Building construction where stability is important.
- Use in interior and exterior with high requirement on aesthetics.
- In combination of nature timber and technology of production is possible to use this beams at aesthetics places.



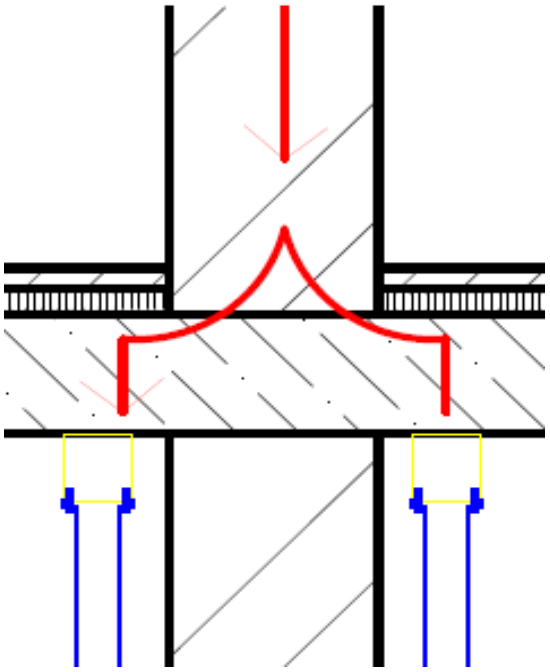
*(**Figure7**): dimensions for BSH beams [refrence5].*

- Upper the joist and under the roofing: 100 x 100mm 3.0m BSH beams.
- Upper the ceiling and under the joists: 200 x 50 mm 3.0m BSH beams.



*(**Figure 8**): the elevation of temporary wall support.*

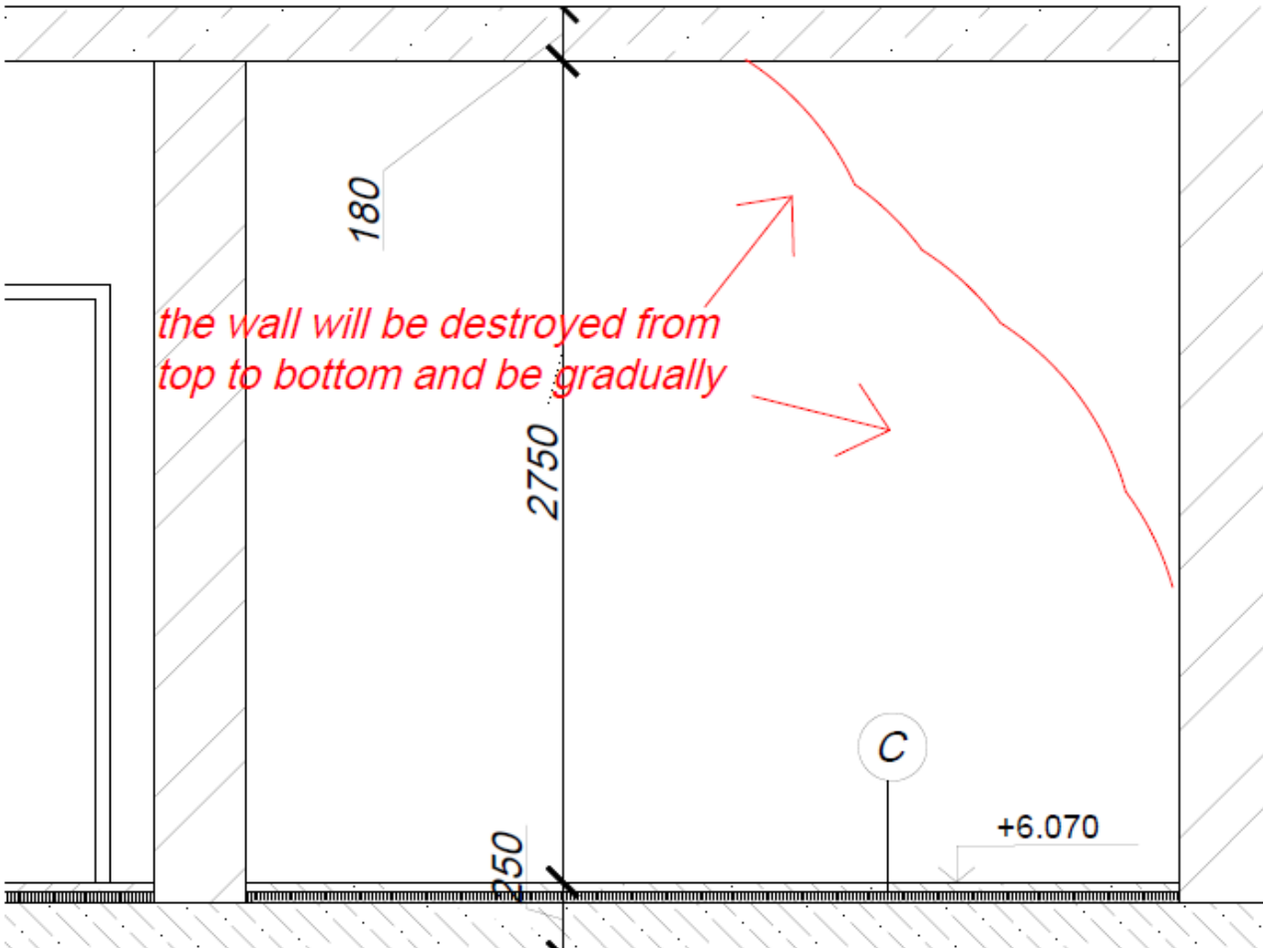
- Yellow color is the load bearing wall have to remove it
- Blue color is the places of joist in temporary support wall.



*(**Figure 9**): distribute load to temporary support wall.*

b.3) Demolition:

- Use utility knife to score the paint and caulk between the wall and the ceiling and the surrounding walls.
- Grab sledgehammer and create a small starter hole between studs. Use a stud finder if don't know where the studs are located.
- Insert the reciprocating saw into the starter hole and cut out a large rectangle of drywall between studs. This will make your project neater and easier than breaking drywall into small pieces with the sledgehammer.
- The process of demolishing the wall from the top from under the distance to the presence of days to the bottom
- Pull out and dispose of insulation if you encounter it. It's unlikely that interior walls will contain insulation.
- Repeat this process until all drywall on the first side of the wall is removed.
- Use saw to repeat the process on the drywall on the other side of the wall.



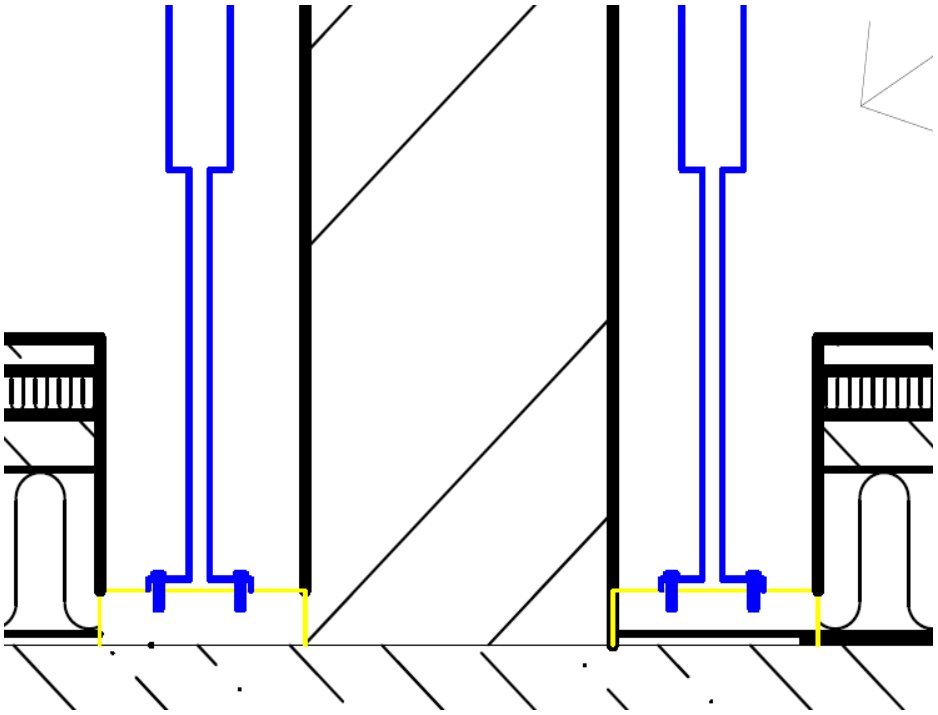
*(**Figure 10**): demolition load bearing wall.*

- When the laying of the temporary wall begins we will remove the material

Above the concrete layer the purpose of removal and transfer of the load directly from

The upper floor to the concrete layer to avoid any Problems associated with the intolerance of insulation or tiles designed.

- The material will be remove it from ceiling is :
- GLASTEK 40 SPECIAL MINERAL 4mm
- bottom XSP insulation with 170mm thickness
- Concrete flooring thickness 70mm
- XSP Insulation thickness 40mm
- Plain Ceramics, Ceramic Mortar, Adhesive Ceramics 30mm.

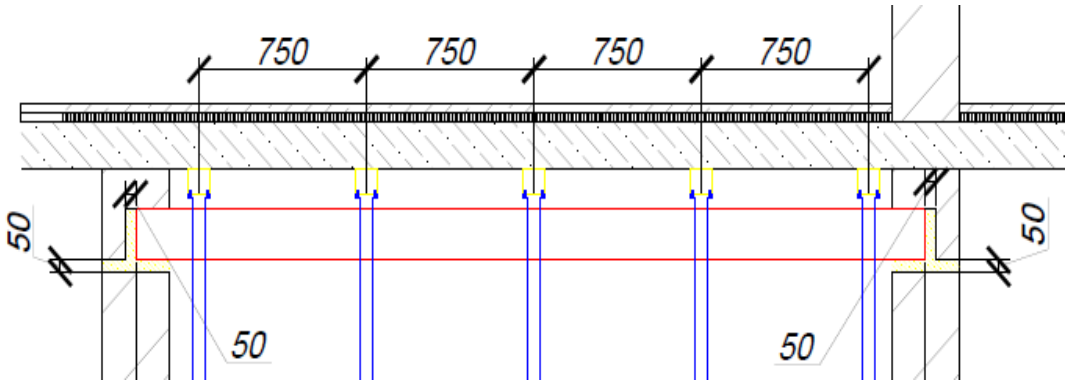


*(**Figure 11**): demolition under the joists.*

b.4) Permanent support:

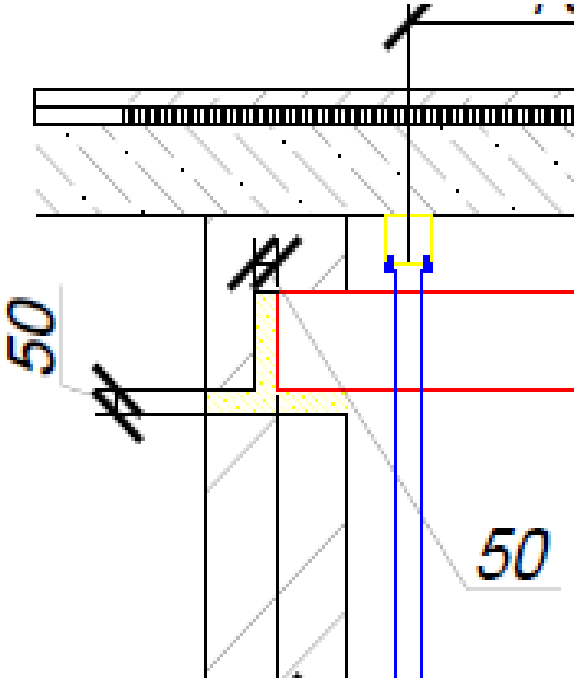
The load has been taken into consideration and therefore on this basis the beam is designed
So the steel beam is UPN 200 3.15X0.200X0.075m from both side of the wall

- Transport of steel beam can be from the window nearest the site of demolition to easy can move it by trolley
- When the beam under the load bearing wall can be easily rise it to the right position
  In which have a space in both sides cause the actually distance of beam is 3.1 m
  But designed 25 cm for one side to can input the beam and after support the beam from Bottom with brick wall.

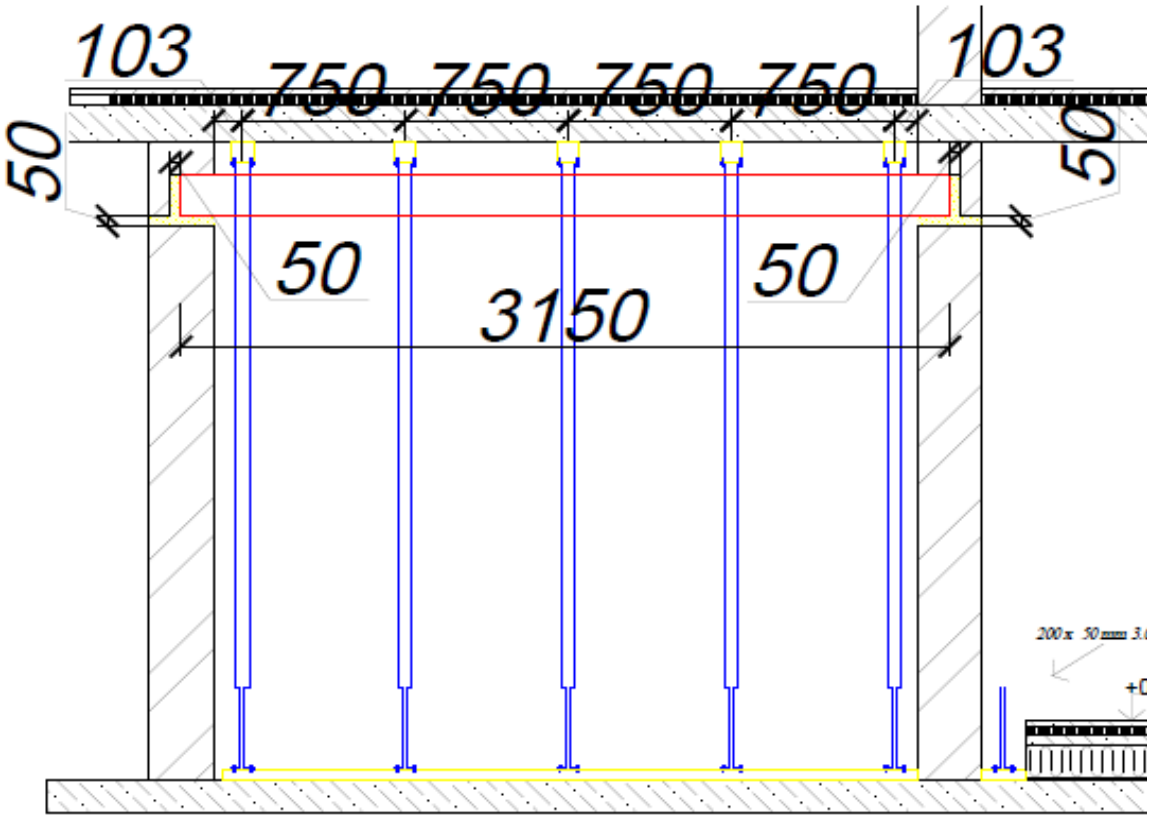


*(**Figure 12**): replace steel beam to the place supporting.*

- Before set the steel beam in the position designed cement mortar 50mm
  Under the beam and the side of brick wall to covered the brick walls each side.



*(**Figure 13**): the dimensions of cement mortar.*



*(**Figure14**): the distances of beam.*

b.5) Finishing stage:

step1: removing

- Above the steel beam, we dry pack the small gaps up to the first floor support with a semi dry, strong 2:1 cement mixture. This is compacted into the gaps between the beam and the first floor.

- After curing for 24hrs, the support props can be removed surrounding the support beam, leaving the two steel joists in place under the support beam for a further 24hrs.

- After the 24hr curing process all steel joist props can be removed and the beam bares the weight of the first floor.

- Remove all dirt and all broken materials from the demolition process (Such as demolished wall, residual cement, casings of materials used)

Step2: Repair Ceiling and Floor

- Patch the Ceiling Where the Wall Was Removed

- Insert wood strips across the hole so they lay in the ceiling to bridge the gap. Screw both ends of each strip to the existing ceiling with the drill to make sure they are secure.

- Cut a piece of drywall a quarter of an inch smaller than the hole and secure it to the strips using screws.

- Spread drywall compound around the edges of the patched hole. Push drywall tape into the wet compound, then add another layer of compound and smooth it out.

- Repeat this process to patch the wall depending on the placement of the wall you removed.

- After finishing this process, the beam is wrapped with a hardened wooden pallet, which can then be painted.

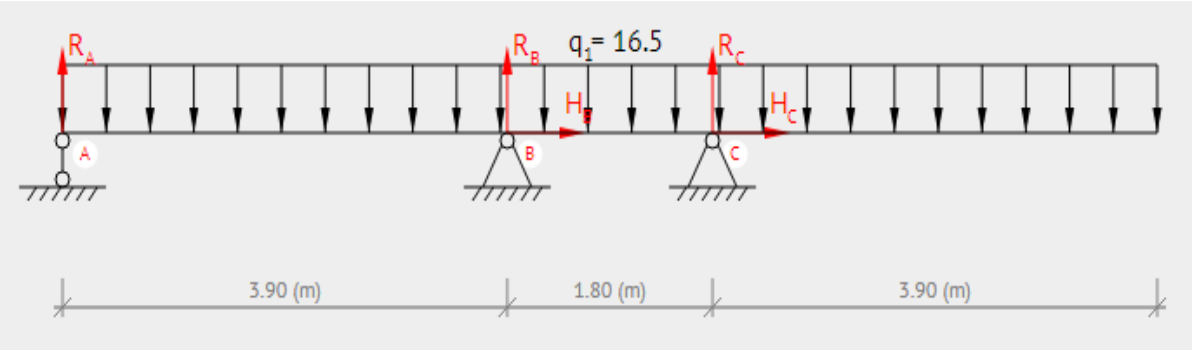
- Return the material removed which removed to install the temporary support wall from the ground so that we can fill or return the same materials If they were carefully removed. (***See figure11***)

- Re-paint all parts that have been added with full paint for the wall and ceiling so that there is no distortion.

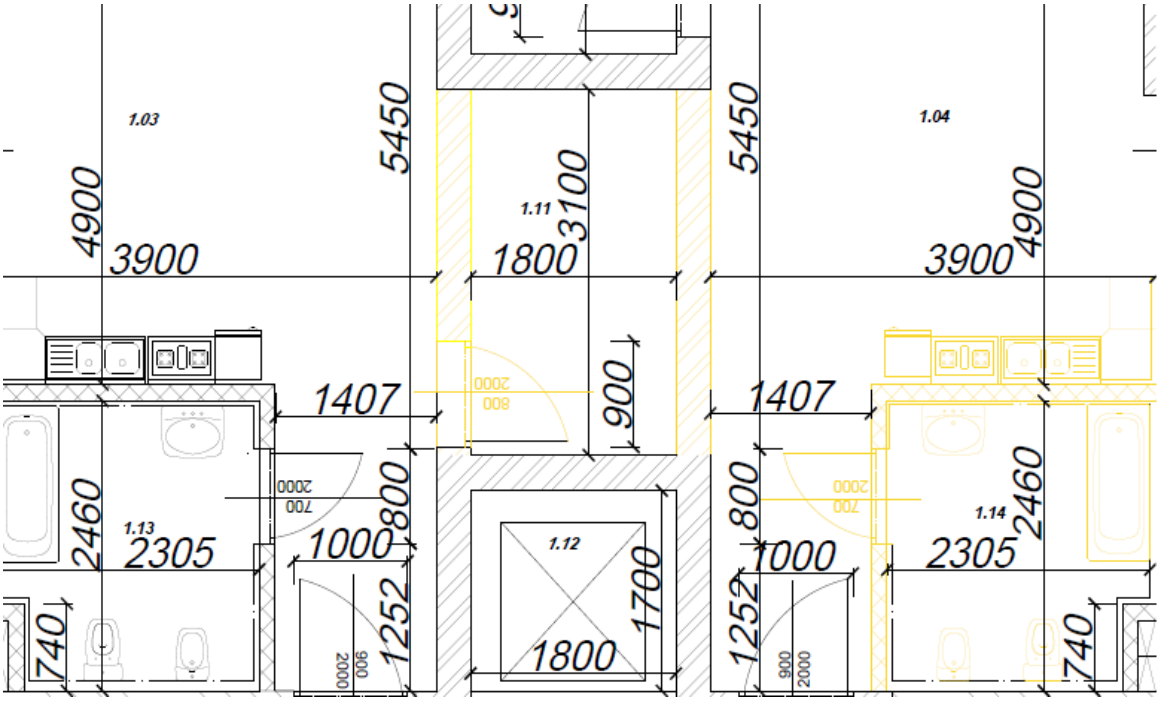
E. Reconstruction

E.1 calculations of loads:

Description	Notes	Characteristics KN/M^2	γF	Design KN/ M^2
Self weight	**hs=180 mm** **25 KNm^{-3}**	**4.5**	**1.35**	**6.08**
Ceramic	**48.8 kg/m^2**	**0.488**	**1.35**	**0.65**
Insulation EXP	**0.97 kg/m^2**	**0.1**	**1.35**	**0.013**
Clay tile with Mortar	**107.42**	**1.05**	**1.35**	**1.41**
Variable load		**2.5**	**1.5**	**3.75**
Not load bearing S.R		**3.0**	**1.35**	**4.5**
Total				**16.5**

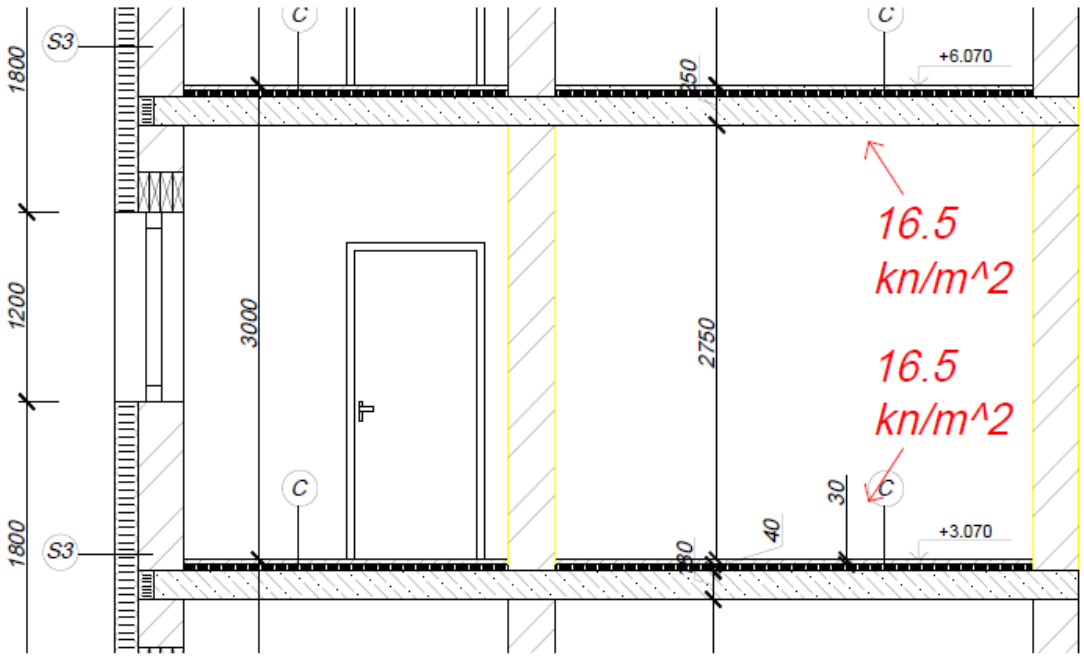


*(**Figure15**): The disturbed load of one floor*



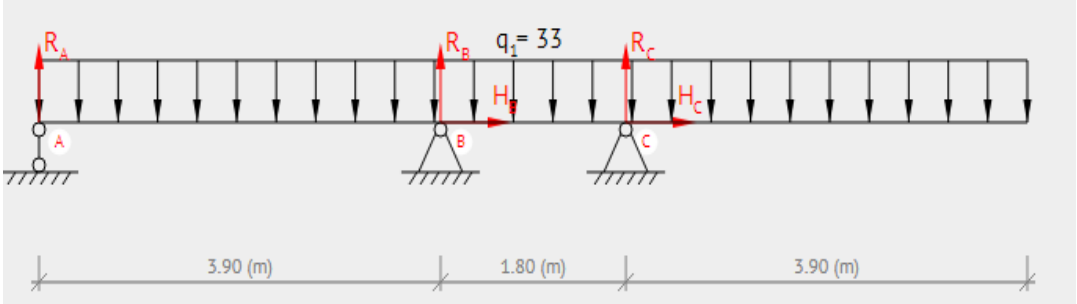
*(**Figure16**): The demolition part*

- The demolition operation will be in second floor so in the case we have to calculate two floors.
- The value of live load and dead load increase to double.



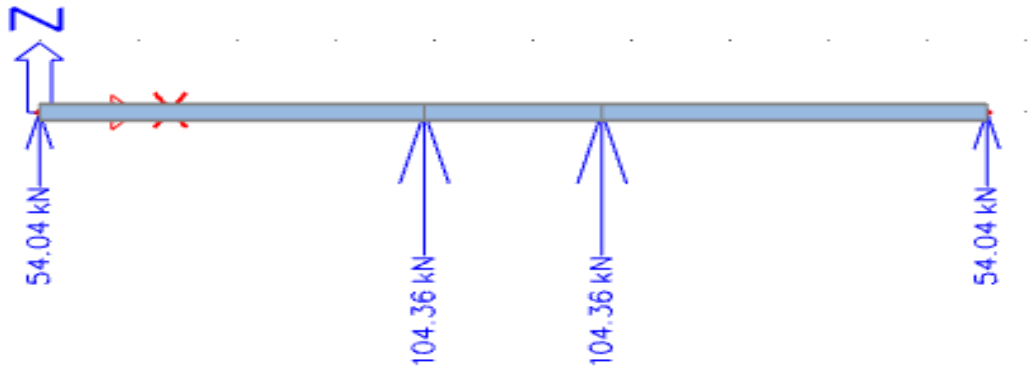
*(**Figure17**): The site view of demolition part*

- After take in case two floor the new load will be as a following picture:

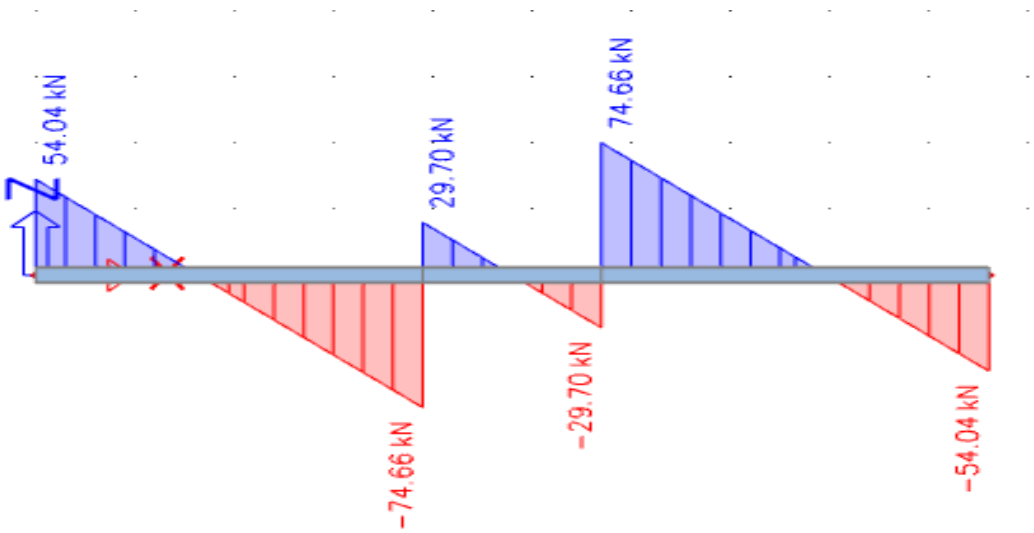


*(**Figure 18**): The disturbed load of two floors*

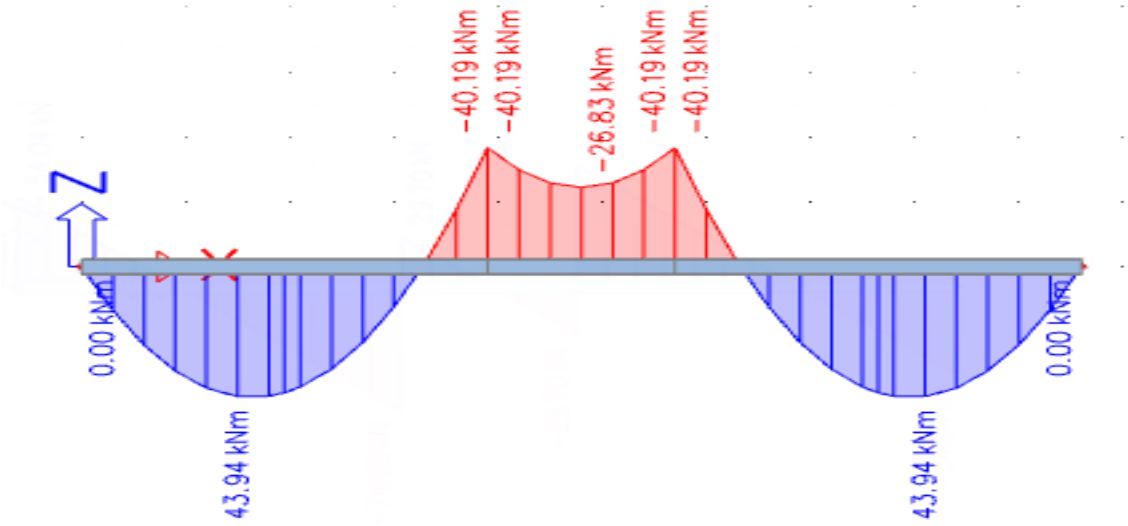
- Calculate it by ***sica software***



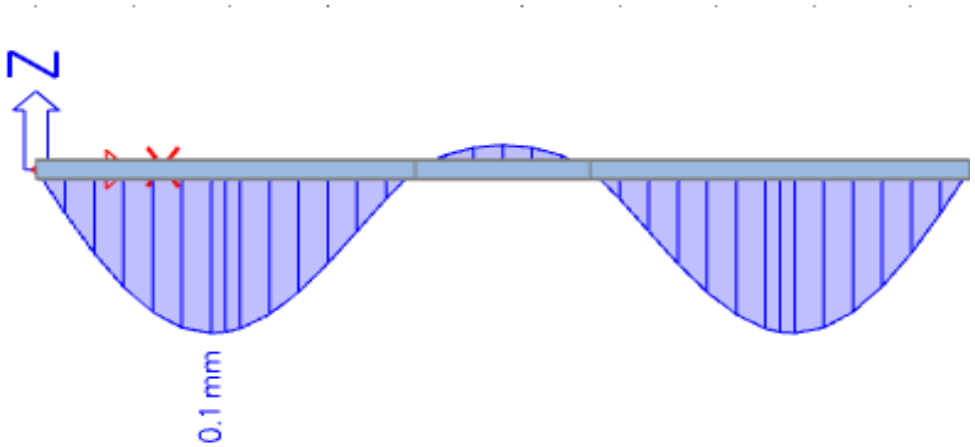
*(**Figure19**): The reaction of two floors.*



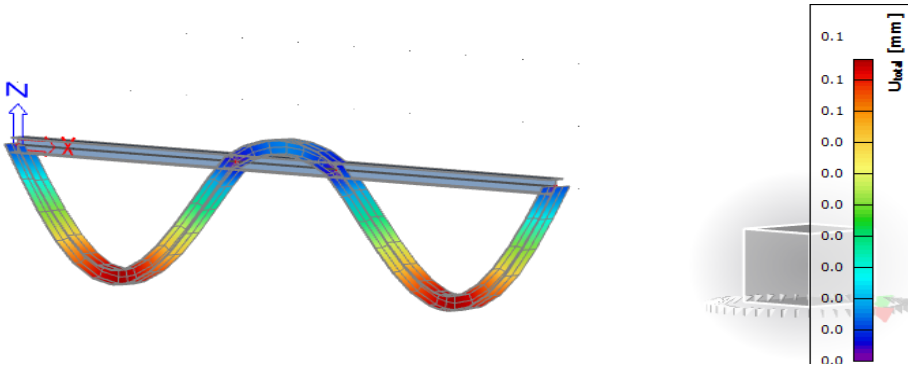
*(**Figure20**): The shear force*



*(**Figure21**): The bending moment*

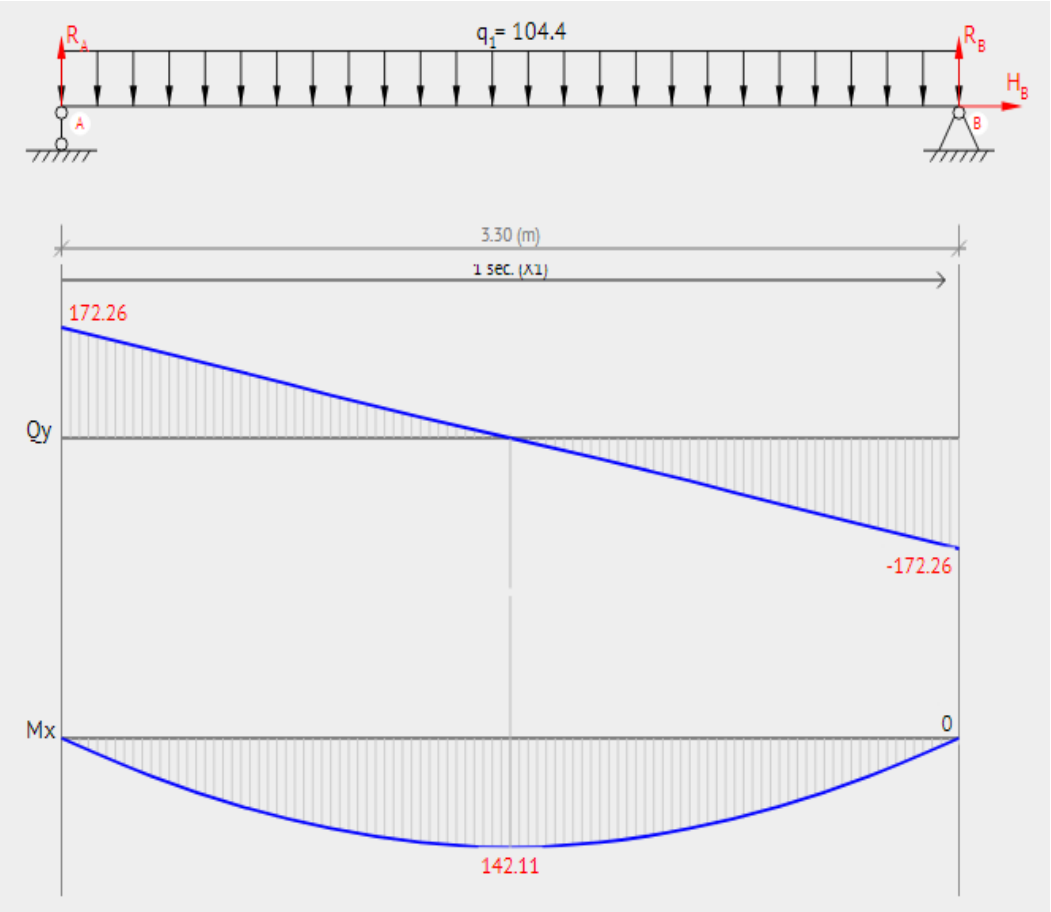


*(**Figure22**): The 1d deformation*



*(**Figure23**): The 3d displacement*

- **Bending moment** $= \frac{wl^2}{8} = \frac{104.4x\ 3.3^2}{8} = 142.11$ **kn.m**



*(**Figure24**): The bending moment*

E.2 Beam design in the middle:

Simply supported beam design-rectangular:

- Design beam as rectangular reinforcement concrete beam :
  - **Material:**

Concrete characteristics Strength, **fck = 30 N/mm²**
Steel characteristics Strength, **fyk= 500 N /mm²**
Reinforcement concrete weight **= 25 KN/m²**

Beam size:

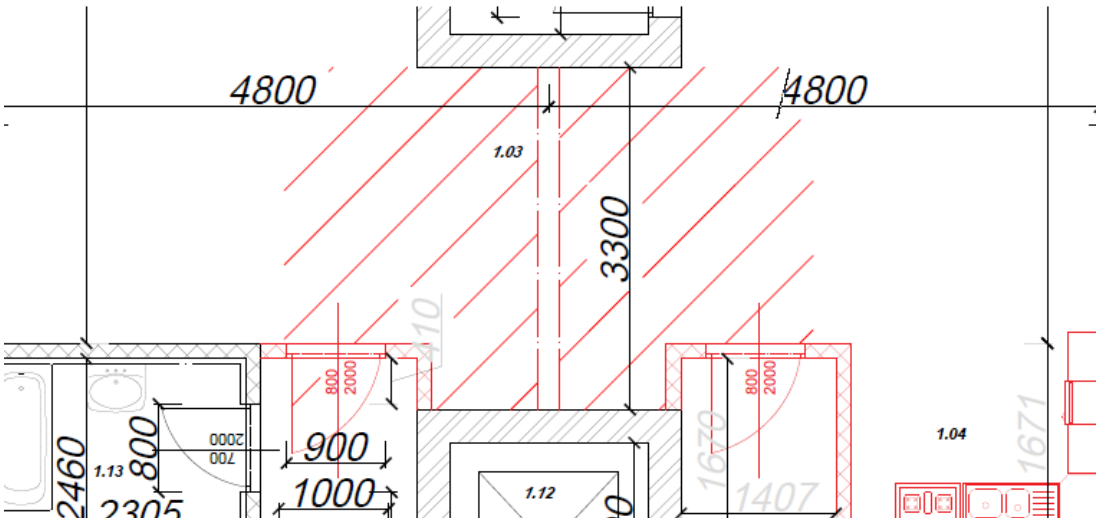
h=3300 / 12 = 275 **- minimum of d = 350 mm**
b=0.4 x 275 = 110 **so try to use b x h = 200 x 500 mm**

  - **Durability fire board and requirement:**

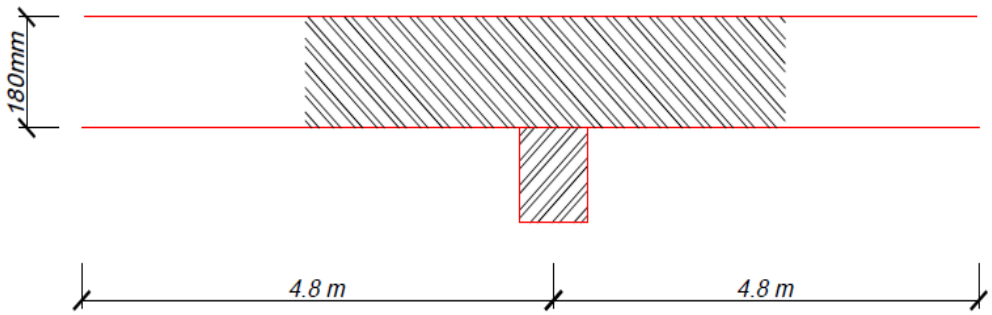
Minimum cover regards to fire **Cimin = asd– Φ Links - Φ bars /2**
= 40 - 8 – 20/2 = 22 mm

Allowance in design for deviation ΔC dev. normal cover **Cnom**:
Cnom = Cmin + ΔC dev = 22 + 10 = 32 mm

: use 35 mm



*(**Figure25**): the distances of slab in the calculation.*



*(**Figure26**): the depth of slab.*

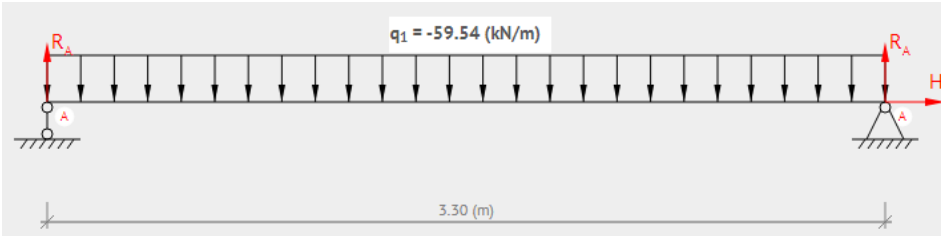
- **Loads:**

VA 3.75 x (4.8/2 + 4.8/2) = 18 KN/m ----qk

PA 4.8 x 0.18 x 25 = 21.6 KN/m
0.2 x 0.5 x 25 = 2.5 KN/m) ---> 24.1 KN/m -> gk

- **Designation:**

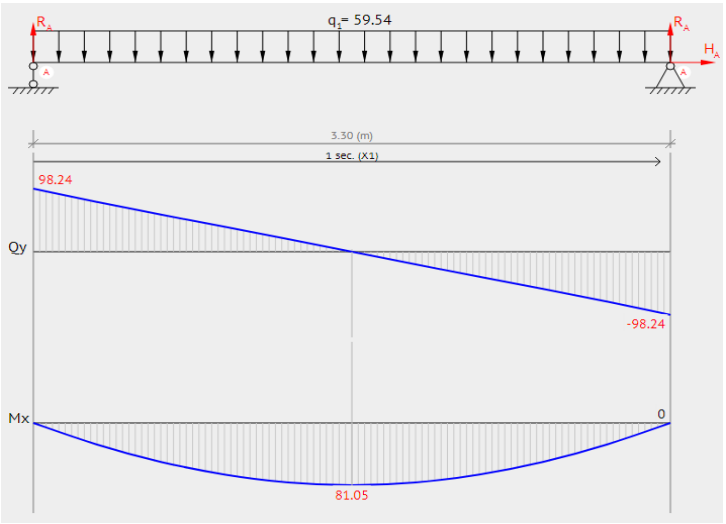
18 x 1.5 + 24.1 x 1.35 = **59.54 KN/m**



*(**Figure27**): the distribution load.*

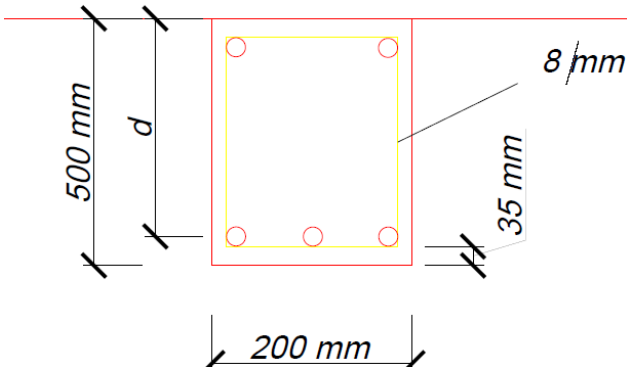
- **Bending moment:**

M= WL²/8 = 59.54 x 3.3²/8 = **81.1 KN/m**



*(**Figure28**): the bending moment by calculation.*

- **Effective depth:**



*(**Figure29**): the distances of beam.*

d= 500 – 35 – 8 -20/2 = 447 mm

Mu = 0.168 x fck x b x d^2
= (0.168 x 30 x 200 x 447^2) / 10^6
= **201.4 KN .m**

So no need compression reinforcement.

K= $\frac{M}{b\ d^2 fck}$ = $\frac{81.1x\ 10^6}{200x447^2x30}$ = **0.067 < K bal= 0.168**

Z= d $\left[0.5+ (0.25 - \frac{0.067}{1.134})^{\wedge\frac{1}{2}}\right]$

Z= 0.93 d = 0.93 x 447

Z= **416 mm**

As= $\frac{M}{0.87\ fy\ X\ k\ X\ z}$= $\frac{81.1x110^6}{0.87\times500\times416}$ = 448.16

Approximately 449 mm²

So Use 2@ 18

- **Minimum and Maximum :**

As min= 0.0015 b X d= **135 mm²**

As max= 0.04 ×b× h= **4000 mm²**

- **Shear :**

V= w L/ 2= $\frac{59.54 \times 3.3}{2}$ = **98.3 KN**

Concrete Strut Capacity:

V_R.d max= $\frac{0.36\ b\ w\ fck\ (1-fck/250)}{(\cot\theta+\tan\theta)}$

At θ = 45 = $\frac{0.36\ X\ 200\ X\ 30(1-30/250)}{\cot 45+\tan 45}$ = **950 KN**

At θ = 22 = $\frac{0.36\ X\ 200\ X\ 30(1-30/250)}{\cot 22+\tan 22}$ = **655 KN**

VE < V_Rd max cot θ = 2.5there for θ = 22 ^{0}
VE < V_Rd max cot θ = 1

- **Shear Links :**

As w/s =V_{Ed} /0.78 fyk d cosθ = 0.513 V_{Ed}/ fyk d

$$= \frac{0.513\ x\ 983\ x\ 10^{3}}{500*447} = \mathbf{0.225}$$

Use link 2 ϕ 8 / m\

Asw= 101 mm min 5 ϕ 8

Spacing s = Asw /0.225 = 101/0.225 = 448.8 = **450 mm**

Max.spacing = sv max = 0.75 x d = 336 mm< 450 mm

so use 300 mm

- **Additional longitudinal reinforcement** (Additional tensile force)

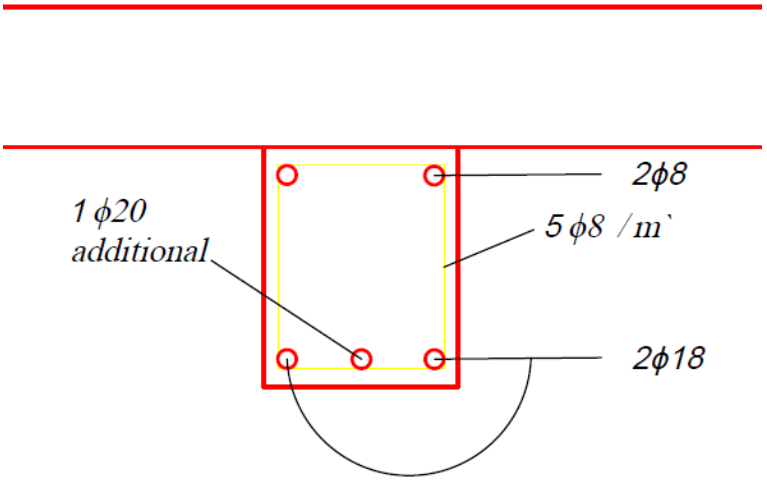
Ftd = 0.5 x V_{Ed} x cotθ = 0.5 x 98.3 x 10^{3} x 2.5

= **122.8 KN**

- **Additional tension force reinforcement.**

As = Ftg/0.87 Fyk = (122.8 x 10^{3}) / (0.87 x 500) = **283 mm²**

Use 1@20 As = 314 mm²



*(**Figure30**): the reinforcement of beam.*

- Deflection :

Percentage of required tension reinforcement :

p =As_{req} / b X d = 449 / (200 x 447)

= **0.0051**

Reference reinforcement ratio:

$p_0 = fck^{\frac{1}{2}} \times 10^{-3} = 30^{\frac{1}{2}} \times 10^{-3} =$ **0.0054**

Factor for structural system , K= 1.0

p_0= 0.0054 > p = 0.0051 ---> increase As

Use 2@20 **As = 628**

p = 628 / 200 x 447

= 0.0070 > p_0 = 0.0054 ---> OK

Use $1/d = 1.0 \times \left[11 + 1.5\sqrt{30} \times \frac{0.055}{0.0070} + \frac{1}{12} \times \sqrt{30} \times \sqrt{\frac{0}{0.0070}}\right]$

= 17.5 ----> basic span-effective depth ratio

1/d = **17.5**

Modification factor of steel area provided:

-Tension = As_{prov} / As_{req} = 628 / 449 = 1.39 < 1.5

Therfore allowable span effective depth (1/d) allowable :

(1/d) actual = 17.5 x 1.39 = 24.47

Actual span effective depth (1/d) actual
1/d actual = 3300 / 447 = 7.38

1/d allowable = **17.5** > 1/d actual **= 7.38**

1/d allowable > 1/d actual -> ok

- **Cracking :**

Limiting crack width Wmax = 0.3 mm
Steel stress, F_s

$$F_s = \frac{fyk}{1.15} \text{ x } \frac{QK+ 0.3Qk}{0.35\ QK+ 1.5QK} \text{ x } \frac{1}{f} = \frac{24.1 + 0.3x18}{1.35*24.1 +1.5*18} \text{ x } \frac{500}{1.150} = \textbf{950.4 N/mm²}$$

Max Allowable bar spacing = 200 mm

Actual bar spacing, s = [h - 2(C nom) – 2 (ϕ Links)] / 2
= [200 – 2 (8) – 2 (35) – 20]/2
= 47 mm

Actual = 47 mm < allow= 200 mm ----> ok

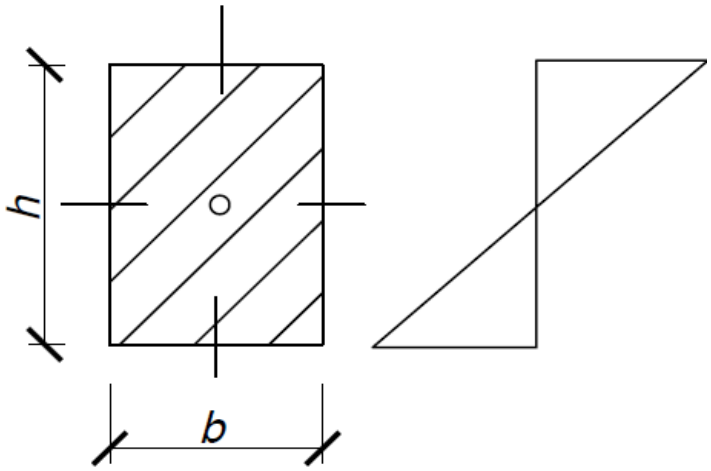
I = $\frac{bh^3}{12}$

fyd= 235 MPa

W = $\frac{I}{h/2}$

$6^{+/-} = \frac{M}{I}\frac{h}{2}$

$6^{+/-}$ < fyd



*(**Figure31**): the distances of steel beam.*

Choosing UPN 200

$I_{Y\,\sqcap}$ = 148 X 10^{-8} m^4

No need to calculate

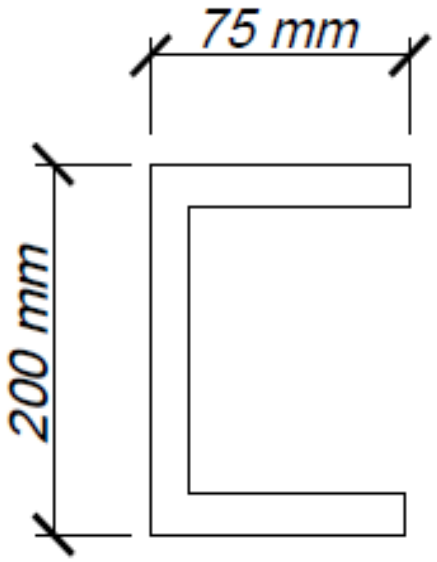
$I_{X\,[}$ = 1910 X 10^{-8} m^4

= 1.09 MPa ≤ fyd

For $I_{X\,[}$: $6 = \frac{M_{Ed}}{I_{[]}}$ x $\frac{h}{2}$

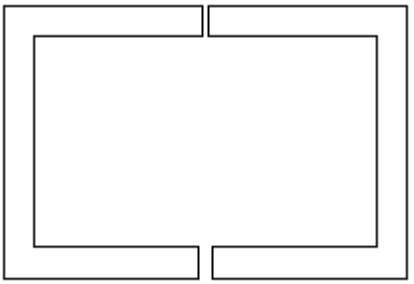
$= \frac{81.1}{2x(1910.10^{-8})}X\frac{0.2}{2}$

= 0.21 MPA ≤ Eyd
= 212303.6 KPa



*(**Figure32**): the distances of UPN 200 section.*

- **Cheek of deflectilon :**



$$\frac{5}{384} \text{ X } \frac{p\,L^4}{EI} = \frac{5}{384} \text{ X } \frac{(59.54 \text{ X } 3.3^4}{210 \text{ X } 10^6 \text{ X}(2 \text{ X } 1910 \text{ X } 10^{-8})}$$

$$= \frac{[\text{KN}]\,[\text{m}]}{[\text{KPa}]\,[\,m^4\,]}$$

= 0.011 m

= 11.46 mm

$\frac{\text{L}}{240} = \frac{3.3}{240}$ = -> **0.01375 m**

-----> **13.75mm ≥ 11.46 mm**

- Eventually all loads spread over one beam were considered

- It will take into account all calculations but the design is converted from one beam to two beams.
- Two beams are designed to place each of the easel walls that was previously destroyed To have the result in two beam in each hand

- In the following page (**E.3**) all the loads were taken into consideration and one beam was designed for each side In total we have two beams

E.3 Beam design in each side's:

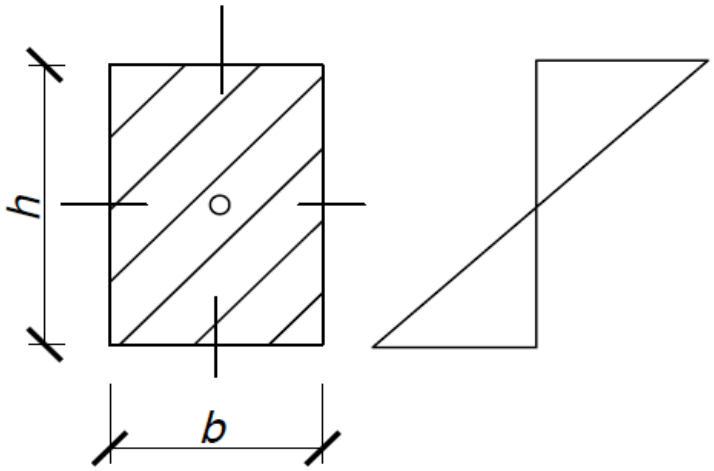
I = $\frac{bh^3}{12}$

fyd= 235 MPa

W = $\frac{I}{h/2}$

$6^{+/-} = \frac{M}{I}\frac{h}{2}$

$6^{+/-}$ < fyd



*(**Figure33**): the distances of steel beam.*

Choosing UPN 260

$I_{Y\,\sqcap}$ = 317 X 10^{-8} m^4

No need to calculate

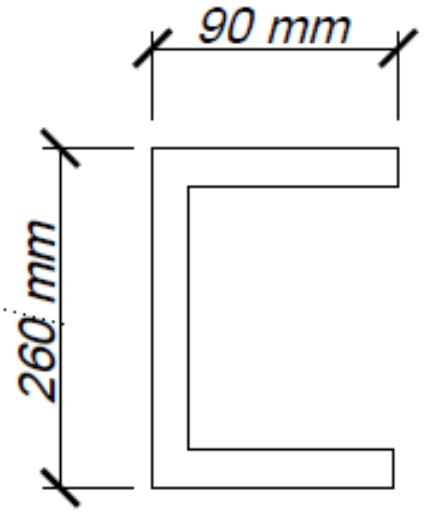
$I_{X\,[}$ = 4820 X 10^{-8} m^4

= MPa ≤ fyd

For $I_{X\,[}$: $6 = \frac{M_{Ed}}{I_{[]}}$ x $\frac{h}{2}$

$= \frac{143}{2x(4820.10^{-8})}X\frac{0.6}{2}$

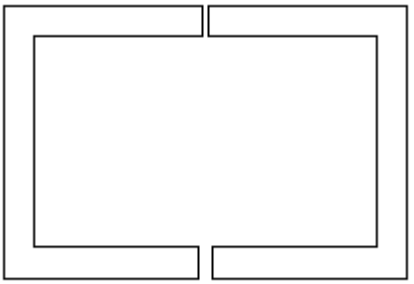
= 192.84 MPA ≤ Eyd
= 19284 KPa



*(**Figure34**): the dimension of UPN 260 section.*

- **Cheek of deflectilon :**

$$\frac{5}{384} \text{ X } \frac{p\,L^4}{EI} = \frac{5}{384} \text{ X } \frac{(143 \text{ X } 3.3^4}{210 \text{ X } 10^6 \text{ X}(2 \text{ X } 4820 \text{ X } 10^{-8})}$$



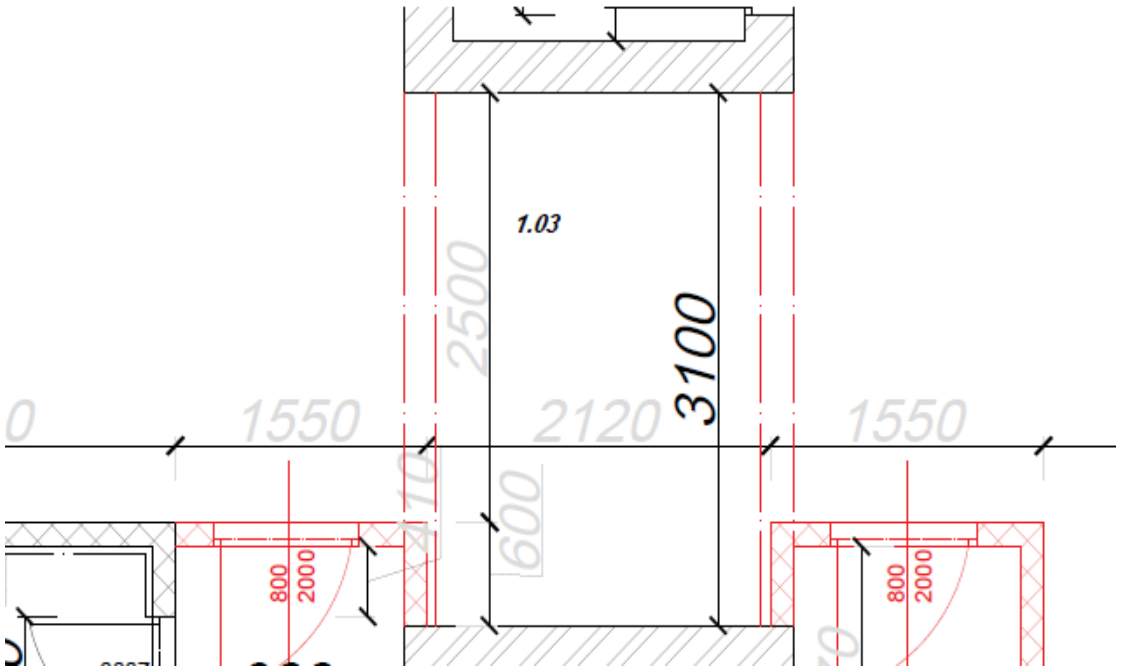
$$= \frac{[\text{KN}]\,[\text{m}]}{[\text{KPa}]\,[\,m^4\,]}$$

$$= 0.0109 \text{ m}$$

= 10.90 mm

$$\frac{\text{L}}{240} = \frac{3.3}{240} = \text{-> } \mathbf{0.01375\ m}$$

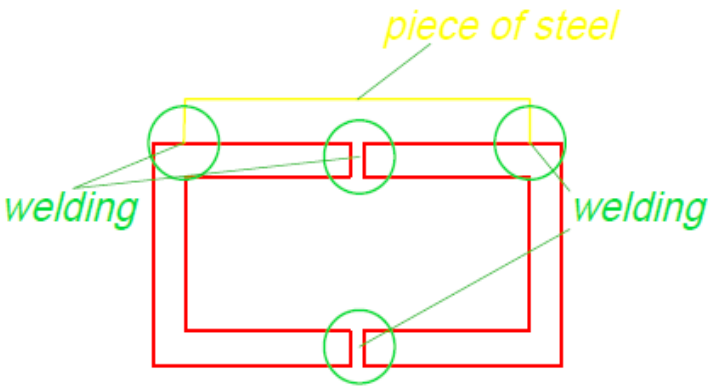
-----> **13.75mm ≥ 10.9 mm**



(Figure35): *the replacement place of beams*

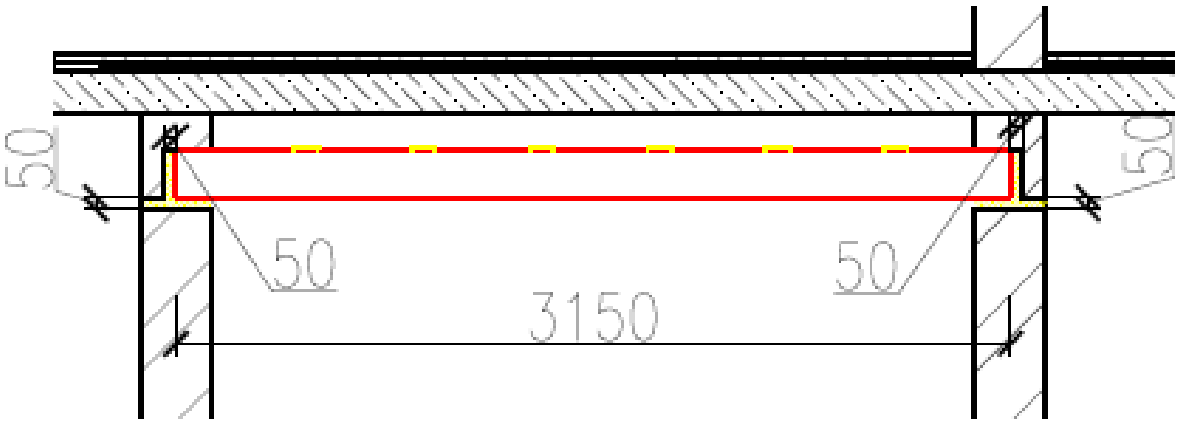
E.4 Connection of profiles:

- Since we have UPN 260 we have to treat each sector as one beam
- The sector will be welded on the adjacent sector as described in figure:



(Figure36): *the welded position in section.*

- The connection is designed so that it is soldering by adding pieces of iron per half meter along the beam.
- A piece of steel is designed to be 10 cm and works to connect the sector to the other so that it is one piece.



(Figure37): *the welded pieces above the beam.*

List of attachment:

1. Certificate of building:

Protocol for the Energy Performance Certificate

Purpose of the certificate processing

☐ New building	☐ Building used by public authorities
☐ Sale of the building or its part	☐ Lease of the building or its part
☐ Larger change of the completed building	☒ Nearly Zero Energy Building
☐ Another purpose:	

Basic information about the evaluated building

Building identification data	
Building address (place, street, street number, ZIP code):	Residential Building
Cadastral area:	336.54 m^2
Parcel number:	
Date of building commissioning (or expected date of commissioning):	2019
Owner or builder:	FAHAD ALMOHAMMED
Address:	technical university of Ostrava - faculty of civil engineering in The Czech Republic - Ostrava – poruba 70800
Company identification number:	00420773104625
Tel./e-mail:	FALHAMOY@GMAL.COM

Building type		
☐ Family house	☒ Residential house	☐ Building for accommod. and catering
☐ Administrative building	☐ Building for health service	☐ Building for education service
☐ Building for sport activities	☐ Building for business purposes	☐ Building for culture activities
☐ Another building type:		

Geometric characteristics of the building		
Parameter	units	value
Volume of the building V (volume of building zones with conditioned internal environment defined by the outer surfaces of building envelope constructions)	[m^3]	2230,0
Total area of the building envelope A (the sum of areas of external building constructions surrounding the volume of the building V)	[m^2]	1430,2
Shape factor A/V	[m^2/m^3]	0,64
Total energy reference area of the building A_c	[m^2]	826,4

Types of energy (energy carriers) used in the building	
☐ Lignite	☐ Coal
☐ Oil	☐ Propan-butan/LPG
☐ Wood (logs), wood chips	☐ Wood pellets
☐ Natural gas	☒ Electricity
☐ System of thermal energy supply (district heating): *RES rate:* ☒ *to 50 % including,* ☐ *over 50 to 80 %,* ☐ *over 80 %*	
☐ Energy of surrounding environment (e.g. solar energy): *purpose:* ☐ *for heating,* ☐ *for hot water preparing,* ☐ *for the electricity production*	
☐ Other fuels or other types of energy supply:	

Types of energy delivered outside of the building		
☐ Electricity	☐ Heat	☒ None

Information about building components and technical systems

A) building components and constructions

a.1) requirements for thermal transmittance

Building envelope constructions	Area A_j	Thermal transmittance			Temper. reduction factor b_j	Heat transfer coeff. by transmittion $H_{T,j}$
		Calculated value U_j	Reference value $U_{N,rc,j}$	Fulfilled		
	[m^2]	[W/(m2.K)]	[W/(m2.K)]	[yes/no]	[-]	[W/K]
WINDOW WITH 3 GLASS	42,06	0,800			1,00	33,6
WINDOW WITH 3 GLASS	49,80	0,800			1,00	39,8
WINDOW WITH 3 GLASS	26,34	0,800			1,00	21,1
Exterior wall	645,33	0,200			1,00	129,1
flat roof	332,42	0,120			1,00	39,9
Doors	2,92	0,900			1,00	2,6
floor on the ground	331,36	0,155			0,74	37,8
Tepelné vazby						28,6
Total	**1 430,2**	**x**	**x**	**x**	**x**	**332,6**

Note: The evaluation of the fulfillment of requirements is required only for larger changes of the building and for other than larger changes of the completed building in the case of evaluation of energy performance in accordance with § 6, paragraph 2, point. c).

a.2) requirements for mean thermal transmittance

Zone	Prevailing design internal temperature $\Theta_{im,j}$	Zone volume V_j	Reference value of the mean thermal transmittance of the zone $U_{em,R,j}$	Product $V_j \cdot U_{em,R,j}$
	[°C]	[m^3]	[W/(m^2.K)]	[W.m/K]
Residental buliding	20,0	2 230,0	0,27	602,10
Total	**x**	**2 230,0**	**x**	**602,10**

Building	Mean thermal transmittance of the building		
	Calculated value U_{em} ($U_{em} = H_T/A$)	Reference value $U_{em,R}$ ($U_{em,R} = \Sigma(V_j \cdot U_{em,R,j})/V$)	Fulfilled
	[W/(m^2K)]	[W/(m^2K)]	[yes/no]
Budova jako celek	0,23	0,27	ano

Note: The evaluation of the fulfillment of requirements is required for a new building, a building with almost zero energy consumption and for larger changes of the completed building in the case of evaluation of energy performance in accordance with § 6, paragraph 2, point. a) and point b).

B) technical systems

b.1.a) heating

Assessed building/zone	Source type	Energy carriers	Coverage of partial energy needs for heating	Energy output	Efficiency of heat source[2]		Efficiency of energy distribution $\eta_{H,dis}$	Efficiency of energy emission $\eta_{H,em}$
					$\eta_{H,gen}$	COP		
	[-]	[-]	[%]	[kW]	[%]	[-]	[%]	[%]
Reference building	x[1]	x	x	x	80	--	85	80
Assessed building/zone:								
Residental buliding	WATER HEATING	soustava ZTE využívající méně než 50% obnovitelnýc h zdrojů	100,0		-- (zdroj mimo budo-vu)		89	88

Note: [1] **x** symbol means that there is no required reference value
[2] it is not filled-in in the case of thermal energy supply system

b.1.b) requirements for the efficiency of the heating system

Assessed building/zone	Source type	Efficiency of heat source energy production $\eta_{H,gen}$ nebo $COP_{H,gen}$	Efficiency of reference heat source energy production $\eta_{H,gen,rq}$ or $COP_{H,gen}$	Fulfilled
	[-]	[%]	[%]	[yes/no]

Note: The evaluation of the fulfillment of requirements is required only for larger changes of the building and for other than larger changes of the completed building in the case of evaluation of energy performance in accordance with § 6, paragraph 2, point. c).

B) technical systems

b.2.a) cooling

Assessed building/zone	Type of cooling system	Energy carriers	Coverage of partial energy needs for cooling	Cooling output	Cooling factor of cold source $EER_{C,gen}$	Efficiency of energy distribution $\eta_{C,dis}$	Efficiency of energy emission $\eta_{C,em}$
	[-]	[-]	[%]	[kW]	[-]	[%]	[%]
Reference building	x	x	x	x			
Assessed building/zone:							

b.2.b) requirements for the efficiency of the cooling system

Assessed building/zone	Type of cooling system	Cooling factor of cold source $EER_{C,gen}$	Cooling factor of reference cold source $EER_{C,gen}$	Fulfilled
	[-]	[-]	[-]	[yes/no]

Note: The evaluation of the fulfillment of requirements is required only for larger changes of the building and for other than larger changes of the completed building in the case of evaluation of energy performance in accordance with § 6, paragraph 2, point. c).

B) technical systems

b.3) ventilation

Assessed building/zone	Type of ventilation system	Energy carriers	Heating energy output	Cooling energy output	Coverage of partial energy needs for ventilation	Nominal electricity input of ventilation system	Nominal volume flow of ventilation air	Specific input of fans for forced ventilation SFP_{ahu}
	[-]	[-]	[kW]	[kW]	[%]	[kW]	[m^3/hour]	[W.s/m^3]
Reference building	x	x	x	x	x	x	x	
Assessed building/zone:								
Residental buliding	přirozené větrání							

B) technical systems

b.4) air humidity adjustment

Assessed building/zone	Type of humidification system	Energy carriers	Nominal electricity input	Nominal energy output	Coverage of partial energy needs for air humidification	Efficiency of air humidification $\eta_{RH+,gen}$
	[-]	[-]	[kW]	[kW]	[%]	[%]
Reference building	x	x	x	x	x	
Assessed building/zone:						

Assessed building/zone	Type of dehumidification system	Energy carriers	Nominal electricity input	Nominal energy output	Coverage of partial energy needs for air dehumidification	Cooling output	Efficiency of air dehumidification $\eta_{RH-,gen}$
	[-]	[-]	[kW]	[kW]	[%]	[kW]	[%]
Reference building	x	x	x	x	x	x	
Assessed building/zone:							

B) technical systems

b.5.a) hot water preparation

Assessed building/zone	Type of hot water preparation in the building	Energy carriers	Coverage of partial energy needs for hot water preparation	Energy input for hot water preparation	Hot water tank volume	Efficiency of heat source for hot water preparation[1)]		Specific heat loss of hot water tank $Q_{W,st}$	Specific heat loss of hot water distribution $Q_{W,dis}$
						$\eta_{W,gen}$	COP		
	[-]	[-]	[%]	[kW]	[liters]	[%]	[-]	[Wh/l.d]	[Wh/m.d]
Reference building	x	x	x	x	x	85	--		150,0
Assessed building/zone:									
Residental buliding	WATER HEATING	soustava ZTE využívající méně než 50% obnovitelných zdrojů	100,0			90			161,4

Note: [1)] not filled in case of thermal energy supply

b.5.b) requirements for the efficiency of the hot water preparation system

Assessed building/zone	Type of hot water preparation system	Efficiency of heat source for hot water preparation $\eta_{W,gen}$ nebo $COP_{W,gen}$	Efficiency of reference heat source for hot water preparation $\eta_{W,gen,rq}$ nebo $COP_{W,gen}$	Fulfilled
	[-]	[%]	[%]	[yes/no]

Note: The evaluation of the fulfillment of requirements is required only for larger changes of the building and for other than larger changes of the completed building in the case of evaluation of energy performance in accordance with § 6, paragraph 2, point. c).

B) technical systems

b.6) lighting

Assessed building/area	Type of lighting system	Coverage of partial lighting energy needs	Total electricity input for lighting of the building	Mean specific input for lighting related to the illumination zone $p_{L,Ix}$
	[-]	[%]	[kW]	[W/(m^2.lx)]
Reference building	x	x	x	0,05
Assessed building/area:				
Residental buliding	LIGHTING SYSTEM LED	100	3,0	0,05

Energy performance of assessed building

a) list of considered zones and partial delivered energies in the building

Assessed building/zone	Heating EP_H	Cooling EP_C	Mechanical ventilation EP_F		Hot water prepa-ration EP_W	Lighting EP_L	Energy production from renewable energy source or cogeneration	
			Without humid. adjustment	With humidity adjustment			For the building	For the building and external delivery
Residental buliding	☒	☐	☐	☐	☒	☒	☐	☐

b) partial delivered energies

r.			Heating		Cooling		Ventilation		Air humidity adjustment		Hot water preparation		Lighting	
			Ref. building	Ass. building	Ref. building	Ass. building	Ref. building	Ass. building	Ref. building	Ass. building	Ref. building	Ass. building	Ref. building	Ass. building
(1)	Energy need	[MWh/year]	35,103	28,741			x	x			14,351	14,351	x	x
(2)	Calculated energy use	[MWh/year]	64,528	36,696							19,460	18,564	2,934	2,934
(3)	Auxiliary energy use	[MWh/year]	0,272	0,451										
(4)	Partial delivered energy (r.4)=(r.2)+(r.3)	[MWh/year]	64,800	37,147							19,460	18,564	2,934	2,934
(5)	Specific partial delivered energy related to total energy reference surface (r.4) / m^2	[kWh/(m2.year)]	78	45							24	22	4	4

c) energy production facility located in the building, on the building or on attached auxiliary objects

Production type	Utilization of produced energy	Produced energy	Total primary energy factor	Non-renew-able primary energy factor	Total primary energy	Non-renewable primary energy
units		[MWh/year]	[-]	[-]	[MWh/year]	[MWh/year]
Cogeneration unit EP_{CHP} - heat	Building					
	Delivery out of the building					
Cogeneration unit EP_{CHP} - electricity	Building					
	Delivery out of the building					
Photovoltaic panels EP_{PV} - electricity	Building					
	Delivery out of the building					
Solar thermal systems $Q_{H,sc,sys}$ - heat	Building					
	Delivery out of the building					
Others	Building					
	Delivery out of the building					

d) distribution of partial delivered energies, of the total primary energy and of the non-renewable primary energy according to energy carriers

Energy carriers	Partial calculated energy use/ Auxiliary energy use	Total primary energy factor	Non-renewable primary energy factor	Total primary energy	Non-renewable primary energy
	[MWh/year]	[-]	[-]	[MWh/year]	[MWh/year]
elektřina ze sítě	3,385	3,2	3,0	10,831	10,154
soustava ZTE využívající méně než 50% obnovitelných zdrojů	55,260	1,1	1,0	60,786	55,260
Total	**58,645**	**x**	**x**	**71,617**	**65,414**

e) requirement for total delivered energy

(6)	Reference building	[MWh/year]	87,195	Fulfilled (yes/no)	ano
(7)	Assessed building		58,645		
(8)	Reference building	[kWh/m^2.year]	106		
(9)	Assessed building		71		

f) requirement for non-renewable primary energy

(10)	Reference building	[MWh/year]	81,605	Fulfilled (yes/no)	ano
(11)	Assessed building		65,414		
(12)	Reference building (r.10 / m^2)	[kWh/m^2.year]	99		
(13)	Assessed building (r.11 / m^2)		79		

g) primary energy of the assessed building

(14)	Total primary energy	[MWh/year]	71,617
(15)	Renewable primary energy (r.14 - r.11)	[MWh/year]	6,203
(16)	The use of renewable energy sources from the point of view of primary energy (r.15 / r.14 x 100)	[%]	8,7

h) values for the derivation of energy classes levels

Values corresponding to the upper limit of Class C:	Total delivered energy	[MWh/year]	96,675
	Non-renewable primary energy	[MWh/year]	112,446
	Mean thermal transmittance of the building	[W/m^2.K]	0,31
	Partial delivered energy: heating	[MWh/year]	74,281
	cooling	[MWh/year]	
	ventilation	[MWh/year]	
	air humidity adjustment	[MWh/year]	
	hot water preparation	[MWh/year]	19,460
	lighting	[MWh/year]	2,934

Table h) contains values used for the derivation of energy classes levels according to Annex No. 2.

Analysis of the technical, economical and environmental suitability of alternative energy supply systems for new buildings and larger changes of completed buildings

Alternative systems	Feasibility assessment			
	Decentralized energy supply systems based on renewable energy sources	Cogeneration	System of the thermal energy supply	Heat pump
Technical suitability				
Economical suitability				
Ecological suitability				
Recommendations for implementation and justification				
Date of analysis completion				
Author of analysis				

Energy assessment	Obligation of the energy assessment preparation	
	Energy assessment is a part of the analysis	
	Date of the energy assessment preparation	
	Author of energy assessment	

Recommended technically and economically suitable measures to improve energy performance of the building

Measure description		Expected mean thermal transmittance of the buiilding	Expected delivered energy	Expected nonrenewable primary energy	Expected savings of total delivered energy	Expected savings of the nonrenewable primary energy
		[W/(m^2.K)]	[MWh/year]	[MWh/year]	[MWh/year]	[MWh/year]
Building components and building constructions:						
			x	x		
Building technical systems:						
heating:		x		x		
cooling:		x		x		
ventilation:		x		x		
air humidity adjustment:		x		x		
hot water preparation:		x		x		
lighting:		x		x		
Operation and maintenance of the building systems:						
		x	x	x		
Other - please specify:						
		x	x	x		
Total		x				

Measure	Assessment of appropriateness			
	Building components and constructions	Technical systems in the building	Maintenance and operation of building systems	Other - please specify:
Technical suitability				
Functional suitability				
Economical suitability				
Recommendations for implementation and justification				
Date of recommended measures preparing				
Author of analysis				
Energy assessment	Energy assessment is a part of the analysis			
	Date of the energy assessment preparation			
	Author of energy assessment			

Energy specialist's final evaluation

New building or building with almost zero energy consumption	
• Building meets the requirement according to § 6 paragraph 1	Ano
• Building energy performance class for the total delivered energy	B
Larger change of completed building or other change of the building	
• Building meets the requirement according to § 6 paragraph 2 point a)	
• Building meets the requirement according to § 6 paragraph 2 point b)	
• Building meets the requirement according to § 6 paragraph 2 point c)	
• Fulfillment of requirements on the building energy performance is not required	
• Building energy performance class for the total delivered energy	
Building used by public authorities	
• Building energy performance class for the total delivered energy	
Sale or lease of the building or its part	
• Building energy performance class for the total delivered energy	
Another purpose of certificate processing	
• Building energy performance class for the total delivered energy	

Identification data of energy specialist who created the certificate

Name and surname	FAHAD ALMOHAMMED
Authorization No. of Ministry of Industry and Trade	
Energy specialist's signature	

Date of certificate creation

Date of certificate creation	07.05.2019

Source of information	http://www.mpo-efekt.cz/cz/ekis/i-ekis/

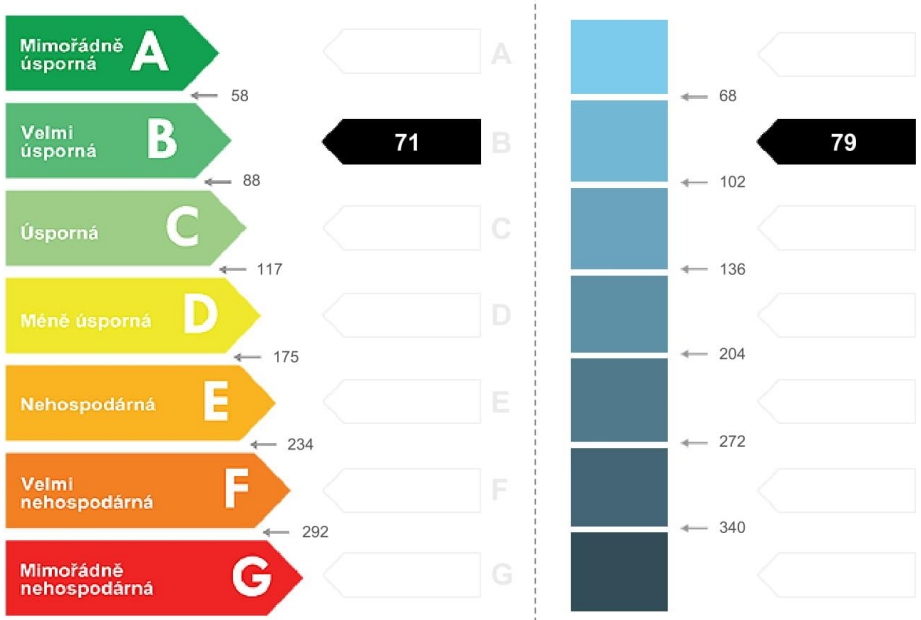
ENERGY PERFORMANCE CERTIFICATE

issued according to Act No. 406/2000 Coll., about energy management, and Directive No. 78/2013 Coll., about building energy performance

Street, number: DIPLOMA THIESES
ZIP code, place:
Building type: Bytový dům
Building envelope area: 1430,2 m^2
Shape factor A/V: 0,64 m^2/m^3
Total energy reference area: 826,4 m^2

ENERGY PERFORMANCE OF THE BUILDING

Total delivered energy (Energy input to the building)	Non-renewable primary energy (Impact of the building on the environment)
Specific values kWh/(m^2·year)	



Values for the whole building MWh/year	58,645	65,414

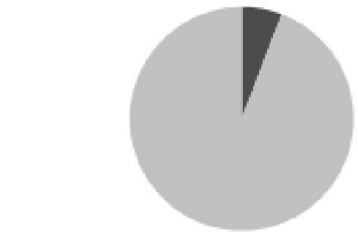
RECOMMENDED MEASURES

Measure for	Defined
Outdoor walls:	☐
Windows and doors:	☐
Roof:	☐
Floor:	☐
Heating:	☐
Cooling:	☐
Ventilation:	☐
Hot water prepar.:	☐
Lighting:	☐
Others:	☐

Description of measures can be found in protocol and their impact on energy performance is shown by an arrow. Doporučení

DELIVERED ENERGY DISTRIBUTION TO ENERGY CARRIERS

Values for the whole building
MWh/year



Elektřina ze sítě: 3,4
Dálkové teplo: 55,3

BUILDING ENERGY PERFORMANCE INDICATORS

	The building envelope	Heating	Cooling	Ventilation	Humidity adjustment	Hot water	Lighting
	U_{em} W/(m²·K)	Partial delivered energy			Specific values	kWh/(m²·year)	
Mimořádně úsporná A							
B	0,23	45					
C						22	4
D							
E							
F							
G							
Mimořádně nehospodárná							
Values for the whole building MWh/year		37,15				18,56	2,93

Author:	FAHAD ALMOHAMMED	**Certificate No.:**	1
Contact:	00420773104625	**Prepared on:**	07.10.2019
		Signature:	fahad almohmmed

2. Day lighting and Sun lighting report:

1 Introduction

1.1 Scope of Assessment

The subject of the report is:

A) the light technical assessment of the level of daylight and sunlight of the interior of the proposed building: residence building.
B) to determine the impact on daylight and sunlight amenity to the existing surrounding buildings.

1.2 Documents, technical standards, software

Daylight and sunlight calculations have been undertaken in accordance with following documents:

[1] residence building
[2] ČSN 73 0580 -1 – Daylighting in Buildings – Part 1: Basic Requirements. June 2007, Z1/2011, Z2/2017.
[3] ČSN 73 0580 - 2 – Daylighting in Buildings – Part 2: Daylighting in Residential Buildings. June 2007, 1/2014.
[4] ČSN 73 4301 Residential Buildings. June 2004, Z1/2005, Z2/2009, Z3/2012.
[5] Software BuildingDesign with computing moduls Wdls 5.0 a SunLis 5.0. ASTRA MS Software s.r.o., Nivy 1506, 765 02 Otrokovice Zlín.

2 Assessment of Daylighting of Residential Building

2.1 Assessment Criterion

Basic requirements for daylighting of buildings are specified in ČSN 73 0580-1: 2007 [2]. Requirements for daylighting of residential buildings are specified in ČSN 73 0580-2: 2007 [3].

At two checkpoints located 1 m from the walls, at half the depth of the room must be a daylighting factor $D \geq 0{,}7\%$. The average value of both of these points must be at the least $D\text{m} \geq 0{,}9\%$.

2.2 Site Plan

It is a three-storey residential building with a roof of the building

As well as stores for each apartment and also an internal store for each apartment and car parking

Angle of nourth : 30 °

The building is located in the Czech Republic - Ostrava – poruba

From google map: https://goo.gl/maps/TXRdpzk6Ss9XmsE69

In front of the residential building to the east and south

Buildings belonging to techinical university of ostrava - faculty of civil engineering

2.3 Assessment & Results

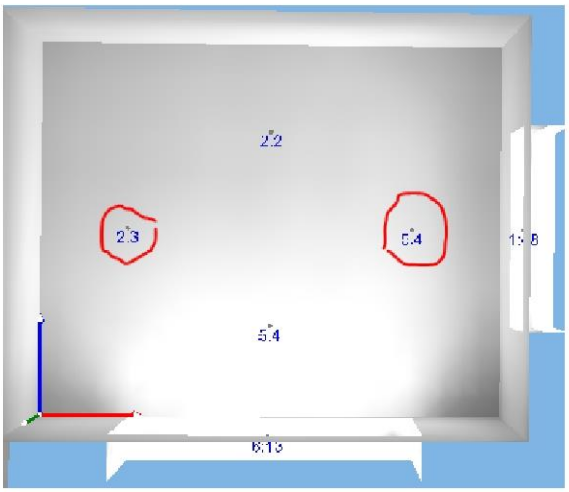
The results of daylighting analysis are shown in full in Appendix 1 (BuildingDesign protocol). The following table 1 is a summary of daylighting in flats

Tab. 1 – Results of daylighting calculation:

Flat	Room	Daylight factor			Evaluation for points	Evaluation for average
		1. Point	2. Point	Average		
		D_1 [%]	D_2 [%]	D_m [%]		
8+1	1.A.1 room	0.8	0.9	0.85	**Yes**	**Yes**
	1.A.2 room	1.3	4.6	2.95	**Yes**	**Yes**
	1.B.1 room	1.6	3.9	2.75	**Yes**	**Yes**
	1.B.2 room	1.4	1.4	1.4	**Yes**	**Yes**
	1.C.1 room	1.3	1.4	1.35	**Yes**	**Yes**
	1.C.2 room	3.8	1.5	2.65	**Yes**	**Yes**
	2.A.1 room	1.4	4.8	3.1	**Yes**	**Yes**
	2.A.2 room	0.8	0.9	0.85	**Yes**	**Yes**
	2.B.1 room	1.8	4.1	2.95	**Yes**	**Yes**
	2.B.2 room	1.4	1.3	1.35	**Yes**	**Yes**
	2.C.1 room	1.4	1.4	1.4	**Yes**	**Yes**
	2.C.2 room	4.7	2.6	3.65	**Yes**	**Yes**
	2.D.1 room	5.4	2.3	3.85	**Yes**	**Yes**
	2.D.2 room	0.9	0.9	0.9	**Yes**	**Yes**
	3.A.1 room	2.3	5.4	3.85	**Yes**	**Yes**
	3.A.2 room	0.9	1.0	0.95	**Yes**	**Yes**
	3.B.1 room	2.6	4.8	3.7	**Yes**	**Yes**
	3.B.2 room	1.4	1.3	1.35	**Yes**	**Yes**

Calculated values of daylight factor D and D_m at both control points must meet the requirements according to ČSN 73 0580-2: 2007:

$$D \geq D_{min,N} = 0,7\%$$
$$D_m \geq D_{m,N} = 0,9\%$$



Graphical output of DF calculation in room by software [5]

3 Assessment of Sunlighting of Residential Building

3.1 Assessment criterion

Requirements for sunlighting of residential buildings are specified in ČSN 73 4301: 2004 [4].

A flat is considered sunny if the sum of its sunny living quarters is equal to at least 1/3 of the sum of all living quarters.

For family houses, semi-detached houses and terraced houses - the sum of sunny living rooms is equal to at least 1/2 of the sum of all living quarters.

A living room is considered to be sunny if the following conditions are met:

(a) the ground plane of the sunbeams must be at least 25 ° main line of the plane of the window opening, the major straight line of the plane being the straight line which is the intersection of that plane with the horizontal plane;
(b) direct sunlight must penetrate into the room through a window or holes with a total area calculated from the composite dimensions of at least one-tenth of the floor space, the smallest component size of the opening must be at least 900 mm for the slanted roof windows at least 700 mm;
(c) the sunlight must reach a critical point in the interior glazing at a height of 300 mm above the center of the lower edge of the illuminating opening but not less than 1 200 mm above the floor of the room under consideration for a specified period;
(d) the height of the sun above the horizon must be at least 5º (for 50º on 1.3. between 7.10 and 4.50 CET, 21.6. between 4.30 and 19.30 CET);
(e) the sunlight duration of the living room must be in case of cloud failure 1 March and 21 June for at least 90 minutes.

3.2 Assessment & Results

The results of sunlighting analysis are shown in full in Appendix 2 and 3 (BuildingDesign protocol). The following table 2 and 3 is a summary of sunlighting in flats. The calculation was made for two dates on March 1 and June 21.

Tab. 2 Results of sunlighting assessment for 1.3.

Flat	Room number	Critical point/ orientation	Start of sunshine [hour]	End of sunshine [hour]	Sunlight duration [min]	Evaluation
8+1	1.A.1 room	North East	7:09	11:20	**251**	Yes
	1.A.2 room	North East	7:09	9:52	**163**	Yes
	1.B.1 room	North west	16:05	16:52	**0:47**	No
	1.B.2 room	North west	14:19	16:52	**153**	Yes
	1.C.1 room	south west	14:19	16:52	**153**	Yes
	1.C.2 room	south west	8:47	16:52	**485**	Yes
	2.A.1 room	North East	7:09	9:52	**163**	Yes
	2.A.2 room	North East	7:09	11:20	**251**	Yes
	2.B.1 room	North west	16:05	16:52	**0:47**	No
	2.B.2 room	North west	14:19	16:52	**153**	Yes
	2.C.1 room	south west	14:19	16:52	**153**	Yes
	2.C.2 room	south west	8:47	16:52	**485**	Yes
	2.D.1 room	south east	7:19	16:52	**573**	Yes
	2.D.2 room	south east	7:15	11:20	**249**	Yes
	3.A.1 room	North East	7:09	9:52	**163**	Yes
	3.A.2 room	North East	7:09	11:20	**251**	Yes
	3.B.1 room	North west	16:05	16:52	**0:47**	No
	3.B.2 room	North west	14:19	16:52	**153**	Yes

Tab. 3 Results of sunlighting assessment for 21.6.

Flat	Room number	Critical point/ orientation	Start of sunshine [hour]	End of sunshine [hour]	Sunlight duration [min]	Evaluation
8+1	1.A.1 room	North East	4:34 6:50	5:07 10:57	**280**	**Yes**
	1.A.2 room	North East	4:34 6:53	5:07 7:39	**151**	**Yes**
	1.B.1 room	North west	4:34 16:24	6:22 19:27	**291**	**Yes**
	1.B.2 room	North west	13:49	19:27	**338**	**Yes**
	1.C.1 room	south west	13:49	19:27	**338**	**Yes**
	1.C.2 room	south west	10:49 16:25	15:37 19:27	**470**	**Yes**
	2.A.1 room	North East	4:34 6:34	6:22 7:31	**165**	**Yes**
	2.A.2 room	North East	4:34 5:17 6:31	5:07 5:24 10:57	**306**	**Yes**
	2.B.1 room	North west	4:34 16:30	6:22 19:27	**285**	**Yes**
	2.B.2 room	North west	13:49	19:27	**338**	**Yes**
	2.C.1 room	south west	13:49	19:27	**338**	**Yes**
	2.C.2 room	south west	10:49	19:27	**518**	**Yes**
	2.D.1 room	south east	5:52	15:37	**585**	**Yes**
	2.D.2 room	south east	4:34 6:12	4:48 10:57	**299**	**Yes**
	3.A.1 room	North East	4:34	10:57	**383**	**Yes**
	3.A.2 room	North East	4:34 6:10	5:24 10:57	**337**	**Yes**
	3.B.1 room	North west	4:34 6:10	5:24 10:57	**337**	**Yes**
	3.B.2 room	North west	13:49	19:27	**338**	**Yes**

4 Assessment of the impact of daylight and sunlight to the existing surrounding buildings

4.1 Assessment Criterion of daylight

Assessment Criterion - the criterion of daylight access to the facade of the building. The requirements are set out in ČSN 73 0580-1 [2].

Tab. 4 Required lowest values of the daylight illumination factor of the $D_{w,s}$ plane of the window glazing from the outside

Category	Type of area under consideration, site character	The lowest $D_{w,s}$ [%]	It corresponds to the angle [°] of shielding
1	Environments with high demands on daylight (daytime facilities for preschool education, school classrooms, etc.)	35	24
2	**Common areas with permanent residence of people**	**32**	**30**
3	Areas of permanent residence of people in a contiguous terraced development in city centers	29	36
4	Spaces of permanent residence of people in extremely tight conditions of historic city centers	24	45

4.2 Assessment & Results

The results of the impact of daylight to the existing surrounding buildings are shown in full in Appendix 5 (BuildingDesign protocol). The following table 5 is a summary of the impact of daylight.

Tab. 5 Results of the daylight illumination factor of the D_w plane of the window glazing from the outside

Surrounding building	Control points	Daylight illumination factor	Required Daylight illumination factor	Evaluation
		D_W [%]	$D_{W,s}$ [%]	
Faculty of civil engineering	Frist Floor No.1	**38.3**	**32**	**yes**

4.3 Assessment Criterion of sunlight & Results

Requirements for sunlighting of residential buildings are specified in ČSN 73 4301: 2004 [4].

The results of the impact of sunlight to the existing surrounding buildings are shown in full in Appendix 6 and 7 (BuildingDesign protocol). The following table 6 and 7 is a summary of the impact of sunlight. The calculation was made for two dates on March 1 and June 21.

Tab. 6 Results of sunlighting assessment for 1.3.

Flat	Room number	Critical point/ orientation	Start of sunshine [hour]	End of sunshine [hour]	Sunlight duration [min]	Evaluation
8	1	west	12:44	19:27	**403**	Yes

Tab. 7 Results of sunlighting assessment for 21.6.

Flat	Room number	Critical point/ orientation	Start of sunshine [hour]	End of sunshine [hour]	Sunlight duration [min]	Evaluation
8	1	west	12:07	16:44	**277**	Yes

5 Conclusions

We can consider that this apartment building

Conforms to the criteria that set the rate specified in all rooms by the ratio of daylight and sunlight

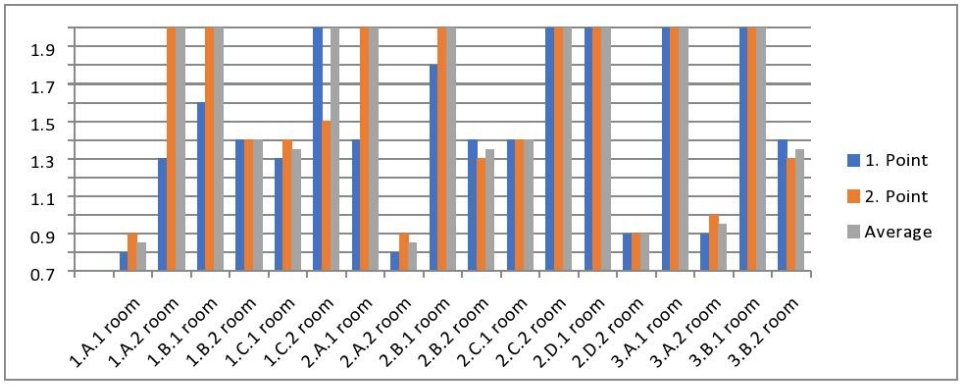
Where the minimum standards are and 0.7 The highest is 0.9

Here in this report shows that all rooms match the standards

But there is only one room below the specified rate according to standards and specifications

But we can go beyond that because this room has sufficient daylight and conforms to standards and specifications.

FLOW CHART OF DAYLIGHTING



3. Teplo of assessment:
   A. External wall:

KOMPLEXNÍ POSOUZENÍ SKLADBY STAVEBNÍ KONSTRUKCE Z HLEDISKA ŠÍŘENÍ TEPLA A VODNÍ PÁRY

podle EN ISO 13788, EN ISO 6946, ČSN 730540 a STN 730540

Teplo 2015

Název úlohy : **external wall**
Zpracovatel : fahad alnohammed
Zakázka :
Datum : 26.04.2019

ZADANÁ SKLADBA A OKRAJOVÉ PODMÍNKY :

Typ hodnocené konstrukce : Stěna vnější jednoplášťová
Korekce součinitele prostupu dU : 0.020 W/m2K

Skladba konstrukce (od interiéru) :

Číslo	Název	D [m]	Lambda [W/(m.K)]	c [J/(kg.K)]	Ro [kg/m3]	Mi [-]	Ma [kg/m2]
1	Omítka vápenná	0,0100	0,8700	840,0	1600,0	6,0	0.0000
2	hules uni 30	0,3000	0,1990	1000,0	830,0	5,0	0.0000
3	Lepící malta E	0,0050	0,3000	840,0	520,0	20,0	0.0000
4	Rigips EPS 70	0,1500	0,0390	1270,0	15,0	20,0	0.0000
5	Výztužná vrstv	0,0050	0,7500	840,0	1000,0	50,0	0.0000
6	Omítka ETICS s	0,0030	0,7000	840,0	1750,0	150,0	0.0000

Poznámka: D je tloušťka vrstvy, Lambda je návrhová hodnota tepelné vodivosti vrstvy, C je měrná tepelná kapacita vrstvy, Ro je objemová hmotnost vrstvy, Mi je faktor difúzního odporu vrstvy a Ma je počáteční zabudovaná vlhkost ve vrstvě.

Číslo	Kompletní název vrstvy	Interní výpočet tep. vodivosti
1	Omítka vápenná	---
2	hules uni 30	---
3	Lepící malta ETICS - terče na 40% plochy	---
4	Rigips EPS 70 F Fasádní (1)	---
5	Výztužná vrstva ETICS	---
6	Omítka ETICS silikonová (zrno 1 mm)	---

Okrajové podmínky výpočtu :

Tepelný odpor při přestupu tepla v interiéru Rsi : 0.13 m2K/W
dtto pro výpočet vnitřní povrchové teploty Rsi : 0.25 m2K/W
Tepelný odpor při přestupu tepla v exteriéru Rse : 0.04 m2K/W
dtto pro výpočet vnitřní povrchové teploty Rse : 0.04 m2K/W

Návrhová venkovní teplota Te : -15.0 C
Návrhová teplota vnitřního vzduchu Tai : 20.0 C
Návrhová relativní vlhkost venkovního vzduchu RHe : 84.0 %
Návrhová relativní vlhkost vnitřního vzduchu RHi : 55.0 %

Měsíc	Délka [dny]	Tai [C]	RHi [%]	Pi [Pa]	Te [C]	RHe [%]	Pe [Pa]
1	31	20.0	57.2	1336.7	-2.3	81.1	409.0
2	28	20.0	59.7	1395.2	-0.6	80.7	468.9
3	31	20.0	60.9	1423.2	3.3	79.4	614.3
4	30	20.0	63.1	1474.6	8.2	77.2	839.1
5	31	20.0	67.9	1586.8	13.3	74.1	1131.2
6	30	20.0	71.8	1677.9	16.4	71.5	1332.9
7	31	20.0	73.7	1722.3	17.8	70.1	1428.0
8	31	20.0	73.0	1706.0	17.3	70.6	1393.5
9	30	20.0	68.2	1593.8	13.6	73.9	1150.4
10	31	20.0	63.7	1488.6	9.0	76.8	881.2
11	30	20.0	61.1	1427.9	3.8	79.2	634.8
12	31	20.0	60.0	1402.2	-0.4	80.5	475.5

Poznámka: Tai, RHi a Pi jsou prům. měsíční parametry vnitřního vzduchu (teplota, relativní vlhkost

a částečný tlak vodní páry) a Te, RHe a Pe jsou prům. měsíční parametry v prostředí na vnější straně konstrukce (teplota, relativní vlhkost a částečný tlak vodní páry).

Pro vnitřní prostředí byla uplatněna přirážka k vnitřní relativní vlhkosti : 5.0 %

Výchozí měsíc výpočtu bilance se stanovuje výpočtem podle EN ISO 13788.
Počet hodnocených let : 1

VÝSLEDKY VÝPOČTU HODNOCENÉ KONSTRUKCE :

Tepelný odpor a součinitel prostupu tepla podle EN ISO 6946:

Tepelný odpor konstrukce R : 4.836 m2K/W
Součinitel prostupu tepla konstrukce U : **0.200 W/m2K**

Součinitel prostupu zabudované kce U,kc : 0.22 / 0.25 / 0.30 / 0.40 W/m2K
Uvedené orientační hodnoty platí pro různou kvalitu řešení tep. mostů vyjádřenou přibližnou přirážkou podle poznámek k čl. B.9.2 v ČSN 730540-4.

Difúzní odpor a tepelně akumulační vlastnosti:

Difuzní odpor konstrukce ZpT : 2.8E+0010 m/s

Teplotní útlum konstrukce Ny* podle EN ISO 13786 : 955.8
Fázový posun teplotního kmitu Psi* podle EN ISO 13786 : 16.0 h

Teplota vnitřního povrchu a teplotní faktor podle ČSN 730540 a EN ISO 13788:

Vnitřní povrchová teplota v návrhových podmínkách Tsi,p : 18.29 C
Teplotní faktor v návrhových podmínkách f,Rsi,p : **0.951**

Číslo měsíce	Minimální požadované hodnoty při max. rel. vlhkosti na vnitřním povrchu: 80%		100%		Vypočtené hodnoty		
	Tsi,m[C]	**f,Rsi,m**	**Tsi,m[C]**	**f,Rsi,m**	**Tsi[C]**	**f,Rsi**	**RHsi[%]**
1	14.7	0.762	11.3	0.609	18.9	0.951	61.2
2	15.4	0.775	11.9	0.608	19.0	0.951	63.5
3	15.7	0.741	12.2	0.535	19.2	0.951	64.1
4	16.2	0.680	12.8	0.387	19.4	0.951	65.4
5	17.4	0.609	13.9	0.089	19.7	0.951	69.3
6	18.3	0.518	14.8	------	19.8	0.951	72.6
7	18.7	0.401	15.2	------	19.9	0.951	74.2
8	18.5	0.455	15.0	------	19.9	0.951	73.6
9	17.4	0.601	14.0	0.057	19.7	0.951	69.5
10	16.4	0.670	12.9	0.356	19.5	0.951	65.9
11	15.7	0.736	12.3	0.523	19.2	0.951	64.2
12	15.4	0.776	12.0	0.608	19.0	0.951	63.8

Poznámka: RHsi je relativní vlhkost na vnitřním povrchu, Tsi je vnitřní povrchová teplota a f,Rsi je teplotní faktor.

Difúze vodní páry v návrh. podmínkách a bilance vodní páry podle ČSN 730540:
(bez vlivu zabudované vlhkosti a sluneční radiace)

Průběh teplot a částečných tlaků vodní páry v návrhových okrajových podmínkách:

rozhraní:	**i**	**1-2**	**2-3**	**3-4**	**4-5**	**5-6**	**e**
theta [C]:	19.2	19.1	9.6	9.5	-14.7	-14.7	-14.7
p [Pa]:	1285	1272	952	930	288	235	138
p,sat [Pa]:	2221	2211	1197	1188	170	169	169

Poznámka: theta je teplota na rozhraní vrstev, p je předpokládaný částečný tlak vodní páry na rozhraní vrstev a p,sat je částečný tlak nasycené vodní páry na rozhraní vrstev.

Při venkovní návrhové teplotě dochází v konstrukci ke kondenzaci vodní páry.

Kond.zóna číslo	**Hranice kondenzační zóny levá [m]**	**pravá**	**Kondenzující množství vodní páry [kg/(m2s)]**
1	0.4115	0.4650	4.223E-0008

Roční bilance zkondenzované a vypařené vodní páry:

Množství zkondenzované vodní páry za rok Mc,a: **0.0879 kg/(m2.rok)**
Množství vypařitelné vodní páry za rok Mev,a: **2.7225 kg/(m2.rok)**
Ke kondenzaci dochází při venkovní teplotě nižší než 0.0 C.

Bilance zkondenzované a vypařené vodní páry podle EN ISO 13788:

Roční cyklus č. 1

V konstrukci dochází během modelového roku ke kondenzaci.

Kondenzační zóna č. 1

Měsíc	Hranice kondenzační zóny levá [m]	pravá	Akt.kond./vypař. Mc [kg/m2s]	Akumul.vlhkost Ma [kg/m2]
1	0.4650	0.4650	5.64E-0009	0.0151
2	0.4650	0.4650	-9.75E-0011	0.0149
3	---	---	-2.04E-0008	0.0000
4	---	---	---	---
5	---	---	---	---
6	---	---	---	---
7	---	---	---	---
8	---	---	---	---
9	---	---	---	---
10	---	---	---	---
11	---	---	---	---
12	---	---	---	---

Max. množství zkondenzované vodní páry za rok Mc,a:	**0.0151 kg/m2**
Množství vypařitelné vodní páry za rok Mev,a je minimálně:	**0.0151 kg/m2**

Na konci modelového roku je zóna suchá (tj. Mc,a < Mev,a).

Poznámka: Hodnocení difúze vodní páry bylo provedeno pro předpoklad 1D šíření vodní páry převažující skladbou konstrukce. Pro konstrukce s výraznými systematickými tepelnými mosty je výsledek výpočtu jen orientační. Přesnější výsledky lze získat s pomocí 2D analýzy.

STOP, Teplo 2015

B. Flat Roof:

VYHODNOCENÍ VÝSLEDKŮ PODLE KRITÉRIÍ ČSN 730540-2 (2011)

Název konstrukce: flat roof

Rekapitulace vstupních dat

Návrhová vnitřní teplota Ti:	20,0 C
Převažující návrhová vnitřní teplota TiM:	20,0 C
Návrhová venkovní teplota Tae:	-15,0 C
Teplota na vnější straně Te:	-15,0 C
Návrhová teplota vnitřního vzduchu Tai:	20,0 C
Relativní vlhkost v interiéru RHi:	50,0 % (+5,0%)

Skladba konstrukce

Číslo	Název vrstvy	d [m]	Lambda [W/mK]	Mi [-]
1	Omítka vápenná	0,010	0,870	6,0
2	Železobeton 1	0,180	1,430	23,0
3	Gefitas AL	0,0001	0,350	3000000,0
4	Beton hutný 1	0,090	1,230	17,0
5	Rigips EPS 100 S Stabil (1)	0,360	0,037	30,0
6	water proofing	0,008	0,210	18570,0

I. Požadavek na teplotní faktor (čl. 5.1 v ČSN 730540-2)

Požadavek: f,Rsi,N = f,Rsi,cr = 0,744
Vypočtená průměrná hodnota: f,Rsi,m = 0,971

Kritický teplotní faktor f,Rsi,cr byl stanoven pro maximální přípustnou vlhkost na vnitřním povrchu 80% (kritérium vyloučení vzniku plísní).

Průměrná hodnota fRsi,m (resp. maximální hodnota při hodnocení skladby mimo tepelné mosty a vazby) není nikdy minimální hodnotou ve všech místech konstrukce. Nelze s ní proto prokazovat plnění požadavku na minimální povrchové teploty zabudované konstrukce včetně tepelných mostů a vazeb. Její převýšení nad požadavkem naznačuje pouze možnosti plnění požadavku v místě tepelného mostu či tepelné vazby.

II. Požadavek na součinitel prostupu tepla (čl. 5.2 v ČSN 730540-2)

Požadavek: U,N = 0,24 W/m2K
Vypočtená hodnota: U = 0,119 W/m2K
U < U,N ... POŽADAVEK JE SPLNĚN.

Vypočtený součinitel prostupu tepla musí zahrnovat vliv systematických tepelných mostů (např. krokví v zateplené šikmé střeše).

III. Požadavky na šíření vlhkosti konstrukcí (čl. 6.1 a 6.2 v ČSN 730540-2)

Požadavky:
1. Kondenzace vodní páry nesmí ohrozit funkci konstrukce.
2. Roční množství kondenzátu musí být nižší než roční kapacita odparu.
3. Roční množství kondenzátu Mc,a musí být nižší než 0,5 kg/m2.rok, nebo 5-10% plošné hmotnosti materiálu (nižší z hodnot).

Limit pro max. množství kondenzátu odvozený z min. plošné hmotnosti materiálu v kondenzační zóně činí:
zóna č. 1: 0,720 kg/m2,rok (materiál: Rigips EPS 100 S Stabil (1)).
Dále bude použit limit pro max. množství kondenzátu: 0,500 kg/m2,rok

Vypočtené hodnoty: V kci dochází při venkovní návrhové teplotě ke kondenzaci.
V konstrukci dochází během modelového roku ke kondenzaci.
Kond.zóna č. 1: Max. množství akum. vlhkosti Mc,a = 0,0049 kg/m2
Na konci modelového roku je zóna suchá.

Vyhodnocení 1. požadavku musí provést projektant.
Ma,vysl = 0 kg/m2 ... 2. POŽADAVEK JE SPLNĚN.
Mc,a < Mc,N ... 3. POŽADAVEK JE SPLNĚN.

Teplo 2015, (c) 2015 Svoboda Software

4.Energy of building envelope:

Protokol k energetickému štítku obálky budovy

Identifikační údaje

Druh stavby	Resdintial bulding
Adresa (místo, ulice, číslo, PSČ)	DIPLOMA THIESES,
Katastrální území a katastrální číslo	
Provozovatel, popř. budoucí provozovatel	
Vlastník nebo společenství vlastníků, popř. stavebník	FAHAD ALMOHAMMED
Adresa	OSTRAVA - CZECH REPUBLIC
Telefon/E-mail	004207731025 - Falhamoy@gmail.com

Charakteristika budovy

Objem budovy ***V*** - vnější objem vytápěné zóny budovy, nezahrnuje lodžie, římsy, atiky a základy	2230,0 m^3
Celková plocha ***A*** - součet vnějších ploch ochlazovaných kontrukcí ohraničujících objem budovy	1430,2 m^2
Objemový faktor tvaru budovy ***A / V***	0,64 m^2/m^3
Typ budovy	nová obytná
Převažující vnitřní teplota v otopném období Θ_{im}	20,0 °C
Venkovní návrhová teplota v zimním období Θ_e	-15,0 °C

Charakteristika energeticky významných údajů ochlazovaných konstrukcí

Ochlazovaná konstrukce	Plocha A_i [m^2]	Součinitel (činitel) prostupu tepla U_i ($\Sigma\Psi_k.l_k + \Sigma\chi_j$) [W/($m^2$·K)]	Požadovaný (doporučený) součinitel prostupu tepla U_N (U_{rec}) [W/(m^2·K)]	Činitel teplotní redukce b_i [-]	Měrná ztráta konstrukce prostupem tepla $H_{Ti} = A_i . U_i . b_i$ [W/K]
WINDOW WITH 3 GLASS	42,1	0,800	1,50 (1,2)	1,00	33,6
WINDOW WITH 3 GLASS 2	49,8	0,800	1,50 (1,2)	1,00	39,8
WINDOW WITH 3 GLASS 3	26,3	0,800	1,50 (1,2)	1,00	21,1
Exterior wall	645,3	0,200	0,30 (0,25)	1,00	129,1
flat roof	332,4	0,120	0,24 (0,16)	1,00	39,9
Doors	2,9	0,900	1,70 (1,2)	1,00	2,6
floor on the ground	331,4	0,155	0,45 (0,30)	0,74	37,8
Tepelné vazby			( )		28,6
Celkem	**1 430,2**				**332,6**

Konstrukce splĹaujÄ- požadavky na součinitele prostupu tepla podle ČSN 73 0540-2.

Stanovení prostupu tepla obálky budovy

Měrná ztráta prostupem tepla H_T	W/K	332,6
Průměrný součinitel prostupu tepla $U_{em} = H_T / A$	**W/(m²·K)**	**0,23**
Požadavek ČSN 730540-2 byl stanoven:	na základě hodnoty Uem,N,20 a působících teplot	
Výchozí požadavek na průměrný součinitel prostupu tepla podle čl. 5.3.4 v ČSN 730540-2 pro rozmezí Θ_{im} od 18 do 22 °C $U_{em,N,20}$	W/(m²·K)	0,39
Doporučený součinitel prostupu tepla $U_{em,rec}$	W/(m²·K)	0,29
Požadovaný součinitel prostupu tepla $U_{em,N}$	**W/(m²·K)**	**0,39**

Požadavek na stavebně energetickou vlastnost budovy je splněn.

Klasifikační třídy prostupu tepla obálky hodnocené budovy

Hranice klasifikačních tříd	Veličina	Jednotka	Hodnota
A - B	$0,5 \cdot U_{em,N}$	W/(m².K)	**0,19**
B - C	$0,75 \cdot U_{em,N}$	W/(m².K)	**0,29**
C - D	$U_{em,N}$	W/(m².K)	**0,39**
D - E	$1,5 \cdot U_{em,N}$	W/(m².K)	**0,58**
E - F	$2,0 \cdot U_{em,N}$	W/(m².K)	**0,78**
F - G	$2,5 \cdot U_{em,N}$	W/(m².K)	**0,97**

Klasifikace: B - úsporná

Datum vystavení energetického štítku obálky budovy: 07.05.2019

Zpracovatel energetického štítku obálky budovy: FAHAD ALMOHAMMED

IČ:

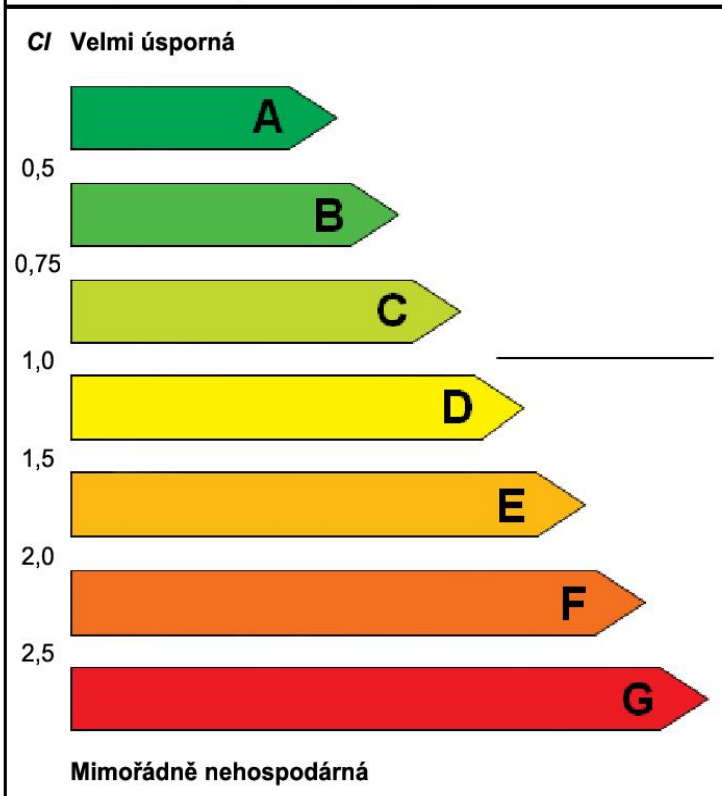
Zpracoval: FAHAD ALMOHAMMED

Podpis: ...fahad almohammed.....

Tento protokol a stavebně energetický štítek obálky budovy odpovídá směrnici evropského parlamentu a rady č. 2002/91/ES a prEN 15217. Byl vypracován v souladu s ČSN 73 0540-2 a podle projektové dokumentace stavby dodané objednatelem.

ENERGETICKÝ ŠTÍTEK OBÁLKY BUDOVY

Bytový dům DIPLOMA THIESES,	Hodnocení obálky budovy	
Celková podlahová plocha A_c = 826,4 m²	**stávající**	**doporučení**



KLASIFIKACE		
Průměrný součinitel prostupu tepla obálky budovy U_{em} ve W/(m²·K) $U_{em} = H_T / A$	0,23	
Požadovaná hodnota průměrného součinitele prostupu tepla obálky budovy podle ČSN 73 0540-2 $U_{em,N}$ ve W/(m²·K)	0,39	

Klasifikační ukazatele *CI* a jim odpovídající hodnoty U_{em}

CI	0,50	0,75	1,00	1,50	2,00	2,50
U_{em}	0,19	0,29	0,39	0,58	0,78	0,97

Platnost štítku do:	Datum vystavení štítku: 07.05.2019
Štítek vypracoval(a):	FAHAD ALMOHAMMED (Kvalifikace)

5.List of drawings:

Drawing no.	**Drawing name**	**Drawing scale**
D.0.0	LANDSCAPE OF BUILDING AREA	1:50
D.0.1	1st FLOOR	1:100
D.0.2	2rd FLOOR	1:100
D.0.3	3th FLOOR	1:100
D.0.4	FOUNDATION	1:100
D.0.5	PLAN OF ROOF	1:100
D.0.6	1st &2rd & 3th FLOOR CEILING	1:100
D.0.7	SOUTH & EAST ELEVATION	1:100
D.0.8	NORTH & WEST ELEVATION	1:100
D.0.9	CROSS SECTION A-A OF BUILDING	1:100
D.0.10	CROSS SECTION S-S OF GREEN ROOF	1:100
D.0.11	2rd FLOOR PLAN OF DEMOLITION	1:100
D.0.12	2rd FLOOR PLAN OF RECONSTUCTION	1:100

6.List of figures:

Conclusion:

A three-floor residential building with load-bearing walls
I designed the three floor individually and also included the foundations and location
Also it is important what I have learned here that the site serves daylight and sunlight
The building was also isolated before implementation of radon emissions
And you make a certificate of efficiency for the building so that it is very good to use
So that both the interior designs are under the system and the code is external as well

- It was taken into consideration that the third floor should include a green roof for the convenience of the population and also serve the theory of sustainable buildings

- Demolition work was also done internally in the building so that these works are under control and do not affect the calculations of loads or rooms and the demolition process in a sequential and regular

- A reconstruction plan for the demolished places has been made so that some details have changed in terms of places
  Example: changing the kitchen and bathroom

- Also re-load loads that affect the building in two similar ways, but was relied on the safest and easiest way to implement and economically better:

1. The first method so that the distributed load is loaded on one beam in the middle
2. The second method, which was recently adopted so that there are two beams in the place where the demolition was done so that the process of replacing the wall bearing the loads to the beam

- Demolition and reconstruction The idea is to merge two apartments into one apartment serving a large family or a larger number of people

References:

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[3] Czech code. ČSN 73 0532/2010. Všechny mistnosti druhych bytů, včetně Přislušenstvi.

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